

THE AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY

ADVISORY EDITORIAL BOARD

CHANNING W. BARRETT
C. L. BONIFIELD
J. WESLEY BOVÉE
W. W. CHIPMAN
JOHN G. CLARK
H. S. CROSSEN
THOMAS CULLEN
EDWARD P. DAVIS
J. B. DELEE
ROBERT L. DICKINSON
PALMER FINDLEY
ROBERT T. FRANK

GEORGE GELLHORN
ALBERT GOLDSPOHN
WILLIAM P. GRAVES
HERMAN E. HAYD
BARTON C. HIRST
E. J. ILL
J. C. LITZENBERG
F. W. LYNCH
FRANKLIN H. MARTIN
C. JEFF MILLER
GEORGE CLARK MOSHER
HENRY P. NEWMAN

GEO. H. NOBLE
REUBEN PETERSON
JOHN OSBORN POLAK
F. F. SIMPSON
HENRY SCHWARZ
J. M. SLEMONS
HOWARD C. TAYLOR
THOMAS J. WATKINS
B. P. WATSON
GEORGE GRAY WARD
J. WHITRIDGE WILLIAMS

OFFICIAL ORGAN OF

THE AMERICAN GYNECOLOGICAL SOCIETY

THE AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS, AND ABDOMINAL SURGEONS
NEW YORK OBSTETRICAL SOCIETY; OBSTETRICAL SOCIETY OF PHILADELPHIA; BROOKLYN
GYNECOLOGICAL SOCIETY; AND ST. LOUIS GYNECOLOGICAL SOCIETY

Editor, GEORGE W. KOSMAK
Associate Editor, HUGO EHRENFEST

VOLUME VIII
JULY, 1924—DECEMBER, 1924

ST. LOUIS
THE C. V. MOSBY COMPANY

1924

. COPYRIGHT, 1924, BY THE C. V. MOSBY COMPANY

*Press of
The C. V. Mosby Company
St. Louis, Mo.*

The American Journal of Obstetrics and Gynecology

VOL. VIII

ST. LOUIS, JULY, 1924

No. 1

Original Communications

THE NEWER GYNECOLOGY*

BY BARTON COOKE HIRST, M.D., PHILADELPHIA, PA.

I CANNOT refrain from expressing my profound appreciation of the kindness of my fellow-members in conferring on me the highest honor of my professional life; a kindness appreciated all the more because I know that many of the members by their loyalty to the Society and their numerous valuable contributions to its transactions are far more worthy of this distinction than I am.

If the custom of the Presidential address is to continue, it should justify itself for robbing the meeting of time that could more profitably be devoted to the scientific programme, by suggestions to further the interests of the Society.

Every existence, be it individual or corporate, shows progression or retrogression. The direction it shall take is determined by qualities inherent in itself or by its environment. The distinguished character of our membership should assure progress, but we are not absolutely secure against the pitfalls that beset the path of every career, and there is much that is disquieting in our political and social environment.

A transplanted and isolated civilization tends to deteriorate. The far distant Grecian colonies to which their founders carried the sacred fire from the public hearth never equaled the glory that was Greece's. Our isolation was accentuated by the violent rupture with the chief source of our culture—Great Britain—in the American Revolution. In consequence we have developed to a greater degree than should be the case in a commonwealth politically and socially sound, traits of

*The President's Address read before the forty-ninth annual meeting of the American Gynecological Society, Hot Springs, Va., May 15 to 17, 1924.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

national character difficult to define by a single word, but best described perhaps as provincial: Ignorance of the rest of the world and of the customs of civilized society, intolerance, overweening self-esteem; a distorted sense of proportion; resentment of foreign criticism, indifference to the lessons of history; insensibility to the inspiration of art, music, literature, to whatever contributes to the joy of living and the attainment of happiness and a disposition to try bizarre experiments in education, legislation and government. We present at present the remarkable spectacle of a people supposed to possess intelligence and political capacity, incorporating in the basic law of the state a mere sumptuary regulation and attempting to enforce it by squandering the public funds, by invading the rights of the individual in a manner not tolerated by English-speaking people since the days of the Stuarts; and by letting loose on the community a horde of spies, provocative agents and disreputable officials "in whose hands is mischief and their right hand is full of bribes." Such an attempt has never succeeded in the whole history of human government and never will.

An inevitable result of ill-considered, impracticable, unenforceable, unnecessary laws is a contempt, not only for all law, but for the law makers who set the first example of disobedience to their own laws. The legislative branch of the Government stands highest in the reverence of a well-governed people; the executive and judicial branches simply administering and interpreting the law. If by their ineptitude, lack of character and intelligence the legislators convert the reverence of the people to a feeling quite the reverse, they commit the nation to its first step toward anarchy or a dictatorship.

Unfortunately we cannot echo Mme. du Deffand's comment on the story of the martyrdom of St. Denis, by Cardinal de Polignae, that in such a situation it is only the first step that counts. Where will this first step lead us? St. Denis, with his gory head in his hands, staggering along the six miles from Mont Martre to the site of his future church, had at least a definite destination. But what of ours? Strangely enough we appear to be moving in two directions at the same time. Contrast our respect for the Presidency with our opinion of Congress. There is a drift toward autocracy, while the prevalence of crimes of violence in the United States, unparalleled in any other English-speaking country shows a drift toward anarchy. Since we convened this morning four people have been murdered and another is being done to death as I speak, for with fourteen thousand six hundred and forty unjustifiable homicides in a single year in the United States, someone somewhere is being murdered every thirty-five minutes and probably with impunity, for in these crimes of violence in this country, the criminal is rarely apprehended and still more rarely punished. There was a time when the quality of our population justi-

fied supreme confidence in the future, no matter what temporary vagaries were to be deplored, but with the neglect of selective immigration, we have fourteen million people of foreign birth, one and a half times that number of foreign parentage, not to mention twelve million negroes, most of whom have never known self-government and are incapable of exercising it.

In moments of discouragement at the prospect of our political future, we cannot help recalling the statement of Tacitus that "it is easier to praise a republican form of government than to establish it, and when it is established it cannot be of long duration" and wondering if we are to add another to the numerous verifications of this prediction afforded by the past twenty centuries.

This is not the time nor the place to analyze our social state and besides it has already been done in recent fiction, showing with photographic accuracy a cross section of American life, too often a drab, monotonous, futile thing, or a mad pursuit of mere pleasure, devoid of grace, dignity, wit, lightheartedness, joyousness, gaiety, of everything that makes life worth while and this too, not among the dregs of the population but among the well-to-do with means to make of their lives all that they might be if these people had not lost the knowledge of how it could be done.

He who lacks the inclination to read this fiction, might look in the mirror held up to us by Langdon Mitchell in his *Diagnosis of Our National Temperament*. He will see a picture of a people losing its grip on the civilization transplanted to this continent from Europe and replacing it by a culture which we can only hope will not prove inferior; a picture all the more startling for the good humor, tolerance and lack of pessimism with which it is presented.

It might well be asked what these desultory thoughts on government and civilization have to do with our Society and its work. Let the oracular Captain Bunsby reply: "The bearings of this observation lays in the application on it." Could we escape the insidious influence on our scientific work, of defects in our political and social environment unless we recognized and avoided them?

There is a tiny cloud on the horizon that might dim the radiance of a brilliant past, if it ever reached much larger dimensions, a thought suggested by the shrinkage not in the quality but in the size of our transactions.

Yielding to the weakness of resting on our laurels, we might relax the efforts which have made us what we are, till we become the mere "shadow of a mighty name" or what is more appropriate to us than Lucan's reference to Pompey, entranced in this Society with its history, achievements, prestige and traditions, might engender in some of us a frame of mind comparable with that of the ancient Greeks who believed they could acquire medical knowledge and skill by

simply sleeping in the Aesculapian Shrines at Epidaurus, the reputed birthplace of the Father of Medicine.

We might stray into an error incidental to our special work. Let the feminist say what she will, the male dominates the female throughout Nature. Dealing with women alone as patients there is noticeable in some of us gynecologists an autocratic manner, an inclination to individualistic thought and practice contrary to the cooperative trend of modern medicine. Enough, however, of "Gorgons and Hydras and Chimaeras dire." Enough of a Cassandra's rôle.

It is pleasanter to contemplate our future achievements, greater, I am convinced, even than those of the past, but taking a different direction.

We will have a juster sense of proportion in assigning their relative importance to the subjects within the scope of our specialty.

The title of our Society being what it is and meaning what it does, a study of woman, the chief act of her life, the reason for her creation and existence, the act of reproduction, must be our chief concern. And what function in the whole realm of medicine has greater importance to the individual, the family and the State than the successful conduct of a childbirth, a fact recognized by Louis XIV when he ennobled Clément on appointing him accoucheur to Mme. La Vallière.

It is not strange that so much space in our Transactions has been devoted to surgical technique. Coincident almost with the origin of this Society was the birth of modern operative gynecology. For the first time in the history of mankind many painful, dangerous and fatal affections in women became amenable to surgical treatment. The men who blazed the way to these discoveries have a rightful place among the great figures of medicine. The inclusion of some of the most distinguished among them in the membership of this Society gave it a lustre outshining its sister special societies and commanding for its transactions the admiration and attention of the whole medical profession. But that day is passed. We have learned our lesson and what is more, have taught it to others. To keep harping on this twice-told tale is to deserve the taunt of the general surgeon that our specialty is no longer necessary. No one can be an expert in the treatment of all the diseases peculiar to women who is not an accomplished pelvic and abdominal surgeon, but he must be something more. He must study all the diseases of women in close correlation with the chief act of a woman's life and must be equally able to deal with the act of reproduction in all its phases, as well as with all the diseases that follow or complicate it. With such knowledge he need fear the rivalry of no general surgeon. Without it he is either a supermidwife or a surgeon of limited ability and experience.

With this broad outlook on our subject there is a fascinating field for future advancement and improvement.

The education of medical students, our successors, according to this modern concept, recognized now everywhere to be correct, should, I think, receive more attention from our members than it has in the past. To whom is the general public, the trustees and faculties of our medical schools to look for advice on this important subject if not to the members of this Society, admittedly containing the most prominent teachers of this branch of medicine in the country. In the humble opinion of an individual member, we should have a standing committee on education in constant communication with the Association of American Medical Colleges, with the Council on Medical Education of the American Medical Association and with the boards of License of the nation and of the several states; and be it said, *sotto voce*, among ourselves, ours should be the prevailing voice in this association in everything pertaining to medical education and requirements in our special subject.

It would be a presumption in a single member to enumerate the possibilities of the future for investigation and discovery, even if he could foresee them all. But there are some problems in the minds not only of ourselves but of the general public that should obviously engage our attention. Among them is the discovery of some method to mitigate the pains of childbirth with safety to the mother and child and practicable for the general physician in private practice. Dr. Gwathmey's recent proposition points one way in this direction I believe, after a personal test of it.

What shall be our attitude toward birth control, a matter in the minds of all of us, physician and layman alike, but about which we seem unwilling to express an opinion? Should we take the leadership in this matter instead of resigning it to people without knowledge of all that it involves? Or should we deliberately and publicly decline to do so, restricting our communication of the knowledge we possess to individual patients at our discretion?

We need not agree with Pope that every woman is at heart a rake, to admit that the fear of pregnancy keeps some women chaste who otherwise might not be so. Are we willing to give authoritative public advice that would remove this deterrent influence? And who is to limit the limitation of fecundity? I have been told of a hamlet in Connecticut of some eight hundred inhabitants containing the typical New England school house. The school has one pupil, a little girl eight years old. When she graduates the school must be closed for there is not another child in sight. Dare we aid in the creation of a Frankenstein that may depopulate the State?

We have an opportunity for an altruistic achievement which no other branch of medicine presents. Fifty-one per cent of women who consult physicians on account of something peculiar to their sex have injured birth canals; 10 per cent have retroversion. We have it in

our power to teach the profession how these conditions can be prevented or immediately cured, thus wiping out 60 per cent of all the diseases of women.

The infections of the puerperium must be studied till we can control them. There has been a strange neglect of this important subject. It was amazing to find so little constructive suggestion in answer to a questionnaire recently sent to many maternities. Chemical disinfection of the blood should be investigated further; a larger intravenous dose of a specific serum than has hitherto been given, as suggested in the Congress at Strasburg last summer, is worth a trial.

Can we not find an antitoxin to the toxins of streptococcaemia? Should we not consider the propriety of using radium in malignant growths always in association with an expert radiologist who has an equipment for the different forms of radiation we could not employ if we had it and without which the patient is not given all the aid this agent might afford her?

The toxemias of pregnancy still await elucidation, and their most successful treatment, standardization.

That most forlorn among a doctor's patients, the sterile wife, should look to us for added knowledge that will give her hope in her pathetic yearning for maternity.

Endocrinology has in store for us discoveries more startling than those already made. To the next generation what we would think marvelous results of hormone treatment will be commonplace. Of this, as of every subject we investigate, a second Cicero could say again with equal truth that posterity will wonder we could be ignorant of things so evident.

The illimitable prospect before us tempts one so far afield that if I wandered farther your patience would be overtaxed. The vision of the age to come so stirs the blood it is difficult to speak with becoming restraint.

There are moments of exaltation in our lives when, at an inspiring thought, the recountal of a noble deed, a touch of genius in art, a glimpse of transcendent beauty in nature, the spark of divinity in us all, bursts into a brighter flame; our cloak of mortality drops partly from us and we look into the future,

"As if the mental eye gained power to gaze
Beyond the limits of the existing world."

In such a mood I see our Society and others like it, sharing the triumphs of their sister medical and surgical associations in the mastery of suffering and disease and in the effort to prolong the span of life; but above all, a privilege all our own, superintending the reproduction, the perpetuation and the improvement of the human race from generation to generation.

THE SERUM TREATMENT OF PUERPERAL SEPSIS*

BY HAROLD BAILEY, M.D., F.A.C.S., NEW YORK, N. Y.

(Continued from page 658, June issue.)

REPORT OF CASES

Group I.—Cases in which the Intrauterine Culture Showed Streptococcus Hemolyticus.

1. *M. S.*, para iii; a case from the prenatal clinic. She was admitted to Bellevue Hospital on April 1, 1923, and discharged on May 10. There were no rectal or vaginal examinations and the delivery was spontaneous. A loop of cord about the neck was slipped over the child's head during delivery.

On the fourth day there was a chill and rise in temperature to 103° with a continued fever ranging between 103° and 104° through several days. The leucocyte count on April 7 was 17,600 with 91 per cent polynuclear cells. A culture was taken from within the uterus and reported as streptococcus hemolyticus. One hundred c.c. of serum was given on the eighth, ninth, eleventh, twelfth and fourteenth days with very little change in the temperature curve. On the fourteenth day the temperature dropped to 102° and reached normal on the seventeenth day. The leucocytes varied from 16,000 to 18,000 until the seventeenth day when they were 25,800 with 80 per cent polynuclear cells. On the ninth day of the puerperium, when the second dose of serum was given, the patient was prostrated and had a distended and tympanitic abdomen and it was evident that there was some peritoneal inflammation. The blood culture was sterile. There was a slight tenderness in the region of the right parametrium throughout the course of the fever. Recovery appeared to be complete and she was discharged on the fortieth day. (Fig 1.)

2. *E. F.*, para i, aged twenty-two; a case from the prenatal clinic. She was admitted to Bellevue Hospital on March 11 and discharged on April 4. The Wassermann was negative. The patient was in labor with the head in the right occiput posterior position and was delivered by forceps. The perineum was lacerated and repaired. The patient at once showed considerable shock and was given 1000 c.c. saline solution by hypodermoclysis.

On the third day the temperature reached 100.6° and then there was a gradual rise to 104° on the eighth day. On this day the intrauterine culture was taken and reported positive for streptococcus hemolyticus. The blood culture was sterile. Following the administration of 100 c.c. of serum on the tenth day there was a marked reaction and rise in temperature to 106.8° . The following day the temperature was 105° with a pulse of 165. From then on there was a gradual drop by lysis with the temperature reaching normal on the sixteenth day and remaining so until discharge. (Fig 2.)

At the time of the intrauterine culture, leucocytes were 37,000 with 92 per cent polynuclear cells. It is probable that this patient had considerable antibody in her blood and that the additional amount furnished by the serum was sufficient to enable her to recover.

3. *O. G.*, para i, aged eighteen; a case from the prenatal clinic. She was admitted on April 4, 1922, and discharged on April 27. There were no rectal or vaginal examinations and the delivery was spontaneous. The perineum was intact.

*Read at a meeting of the New York Obstetrical Society, January 8, 1924.

The temperature rose to 102° on the third day and to 103° on the fourth day remaining as a continued fever until the sixteenth day. The leucocytes were 16,000 with 86 per cent polynuclear cells. One hundred c.c. of serum was given on the seventh day and also on the ninth and eleventh days of the postpartum period. The intrauterine culture was taken on the day of the first injection of serum and showed streptococcus hemolyticus. On the sixteenth day the temperature reached normal and remained there. (Fig. 3.)

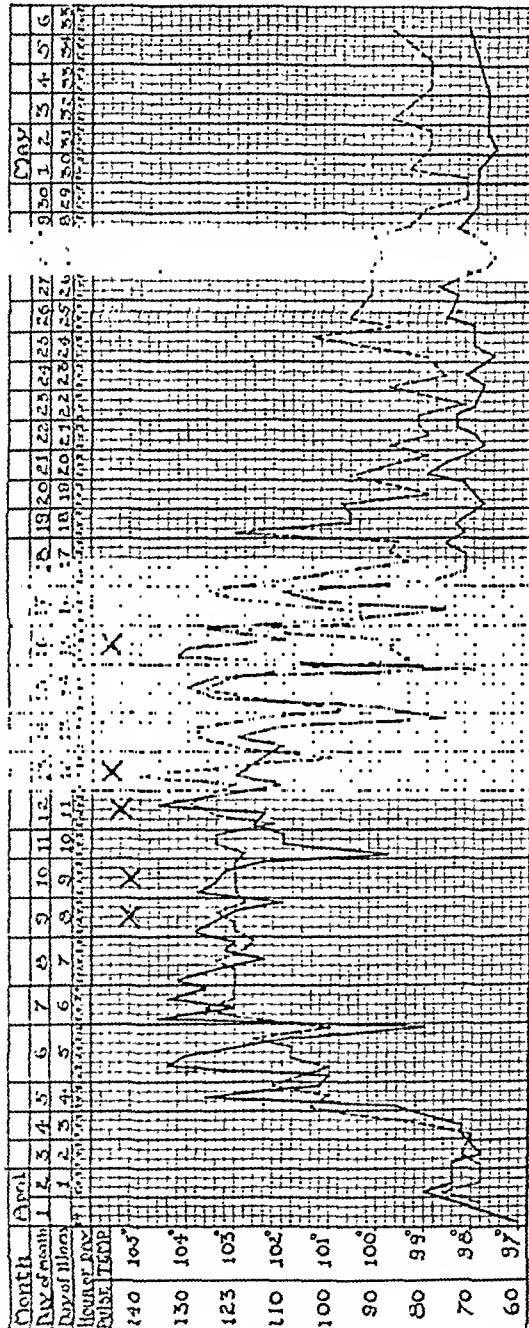


FIG. 1.

J. A. C., para viii; a case from the prenatal clinic. She was admitted to Bellevue Hospital February 23, 1922, and discharged on March 9. She was in the second stage of labor with the membranes presenting. There were no rectal or vaginal examinations and the delivery was spontaneous.

The temperature rose during the night of the third day and reached 103.8° on the fourth day. On this day the leucocytes were 7400 with 77 per cent polymuclear cells. On the third day of the fever the blood culture was sterile. The intrauterine culture showed streptococcus hemolyticus. Fifty c.c. of serum was administered on the sixth day and the temperature did not rise above 101.8°. The next few days it fluctuated below 101°, gradually reaching normal on the 13th day. (Fig. 4.)

5. A. B., para i; aged nineteen; a case from the prenatal clinic. She was admitted to Bellevue Hospital on March 6, 1922, and discharged on the sixty-first day. No rectal or vaginal examinations were made during the labor and the delivery was spontaneous.

On the fourth day the temperature rose to 102.8° and remained as a continued fever fluctuating above 103°. On the third day of the fever the blood culture was taken and reported as negative. The intrauterine culture showed streptococcus hemolyticus. The leucocytes, at the height of the fever, were 14,200 with 85 per cent polymuclear cells. On the seventh day postpartum 100 c.c. of serum was given

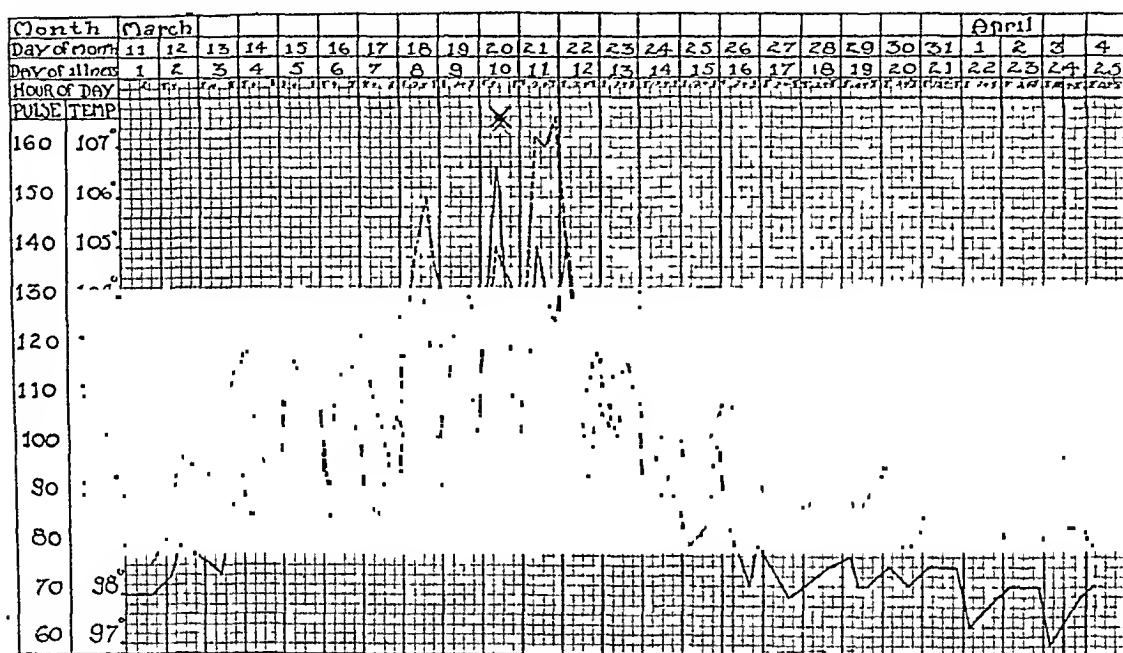


Fig. 2.

and there was a marked reaction, the temperature going to 106°. There was some urticaria, so that although on the following day the temperature was 105°, no serum was given because of the possible dangers of anaphylaxis. Two days later another 100 c.c. was given and was immediately followed by edema of the larynx so that the patient had to be watched for twelve hours. There were fluctuations in the temperature but it gradually reached normal on the eleventh day. (Fig. 5-A and B.)

On the ninth day this patient had evidences of serum sickness in the swelling of all her joints; her knees especially were affected and were acutely tender. There was a period from the sixteenth to the twenty-third day when the temperature fluctuated below 101.1° and during this period a mass developed in the right parametrium and extended well above the brim of the false pelvis. On the twenty-fifth day the temperature reached 103° and then fluctuated during a period of 8 or 9 days. A transfusion of 50 c.c. of blood was made on the thirty-third day and the thirty-sixth day and there was a gradual improvement, the temperature reaching normal on the forty-eighth day; the mass gradually subsided. This patient is again pregnant and in our care.

6. M. M., para v, aged twenty-seven; a case from the prenatal clinic. She was admitted to Bellevue Hospital on April 11th and died there April 30, 1922. This patient was admitted in labor. There were no rectal or vaginal examinations and the delivery was spontaneous. A loop of cord about the neck of the child was slipped over its head during the delivery.

The temperature rose on the third day to 101.6° and remained as a continued

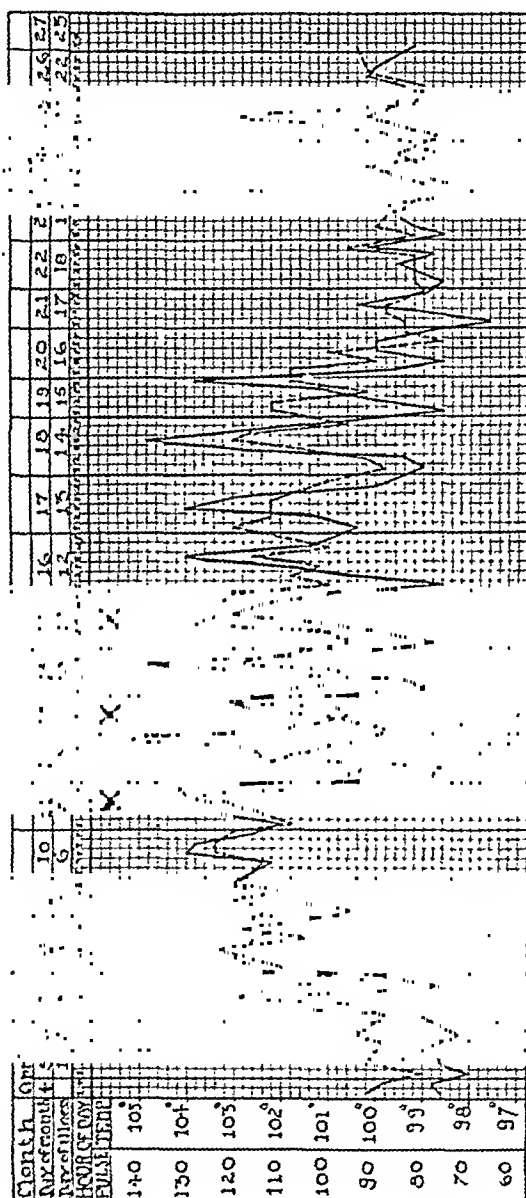


Fig. 3.

fever until the death of the patient on the nineteenth day. After the first three days of fever there were fluctuations in the temperature curve which seemed to indicate that the patient was about to recover spontaneously. However, it rose again to 104° on the ninth day and on the tenth day of the postpartum period 100 c.c. of serum was administered. At this time the leucocytes were 10,500 with 80 per cent polynuclear cells. The intrauterine culture showed streptococcus hemolyticus. On the thirteenth day another injection of 50 c.c. was administered. The patient was exceedingly ill with the abdomen distended and tympanitic. There were signs

in the right chest that pointed to an embolism. At the time of the second injection, the administration had to be stopped because of the effect on the pulse and respiration. The serum had a different laboratory number from that which we had been using for the other cases but it must be admitted that a very insufficient dose was given late in the disease and apparently the organism was a virulent one. Death occurred on the nineteenth day. (Fig. 6.)

Group II.—Eight cases (6 from Bellevue Hospital and 2 from the Bellevue School for Midwives) in which the Blood Culture was Negative and the Intrauterine Culture was Either Negative or not Taken.

1. *R. B.*, para ii, aged twenty-one; a case from the prenatal clinic. She was admitted to Bellevue Hospital on May 15, 1922. This patient had preeclampsia with 3-plus albumin and a blood pressure of 166. The Wassermann was negative. She went into labor on the day following her admission and was delivered by low forceps. No rectal or vaginal examinations were made until the patient was prepared for the operation.

Her temperature 102.4° on the morning of the fourth day and there was a con-

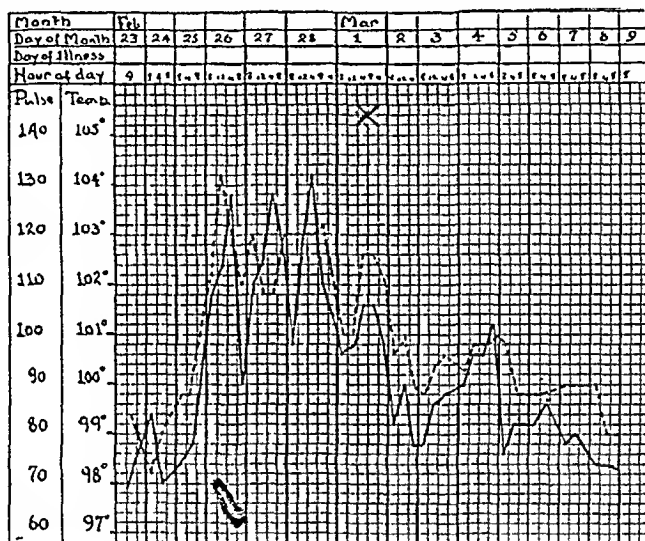


Fig. 4.

tinued fever until the eleventh day. The intrauterine culture was taken, but the report was not noted in the history. On the 3rd day the leucocytes were 14,000 with 86 per cent polynuclear cells. On the sixth and eighth days postpartum 100 c.c. of serum was given. Following the second dose there was a drop in temperature. The blood culture was negative. There was a marked parametritis on the right side. On the twentieth day the temperature rose again to 104° and on the twenty-fifth day with a temperature of 103° and a pulse of 120 she went home against advice. (Fig. 7.)

A short time later she was admitted to the New York Hospital where the cul-de-sac was drained and she recovered.

This patient had a marked serum reaction with urticaria and swelling of the knees and phalangeal joints. Because of this reaction a third dose of serum could not be administered.

2. *C. W.*, para ii, age twenty-nine. This case had had no prenatal care. She was admitted to Bellevue Hospital on April 18, 1922. She was in labor and had a precipitate delivery. No rectal or vaginal examinations were made.

On the second day of the puerperium the temperature reached 103.8° and remained

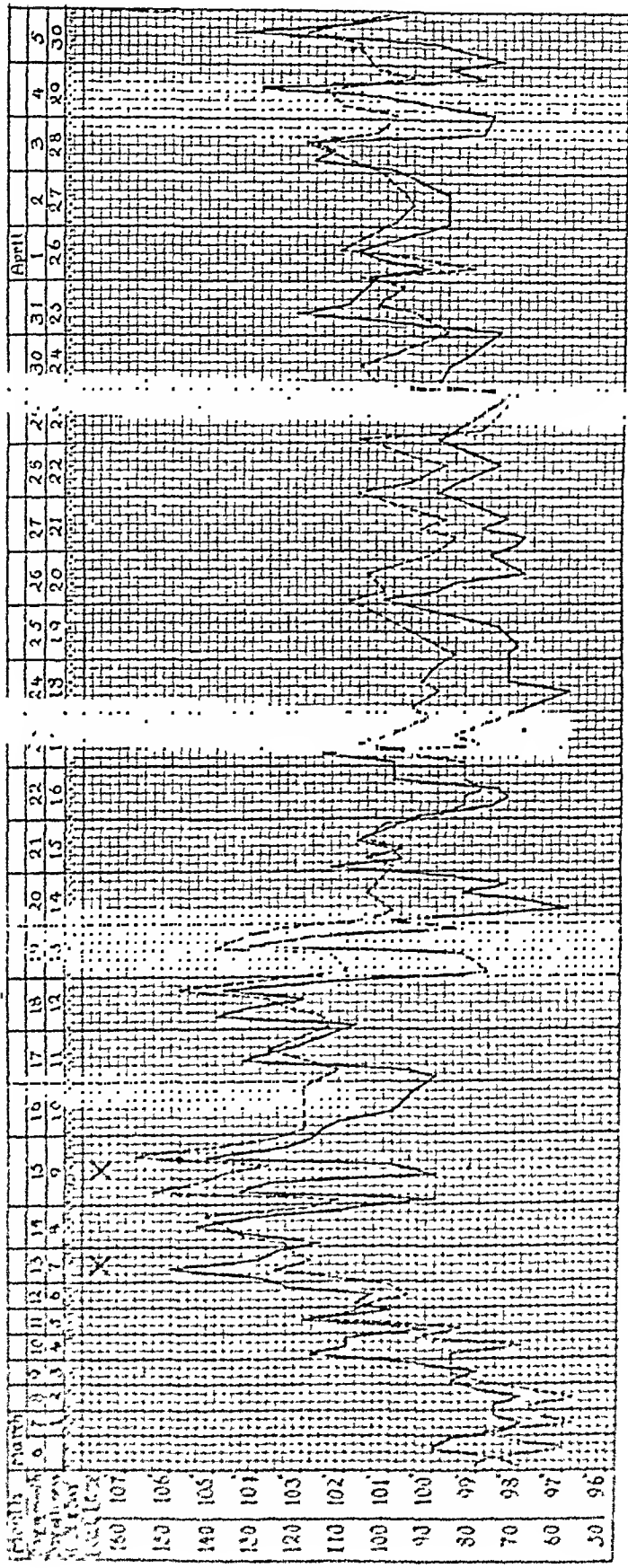


Fig. 5-1.

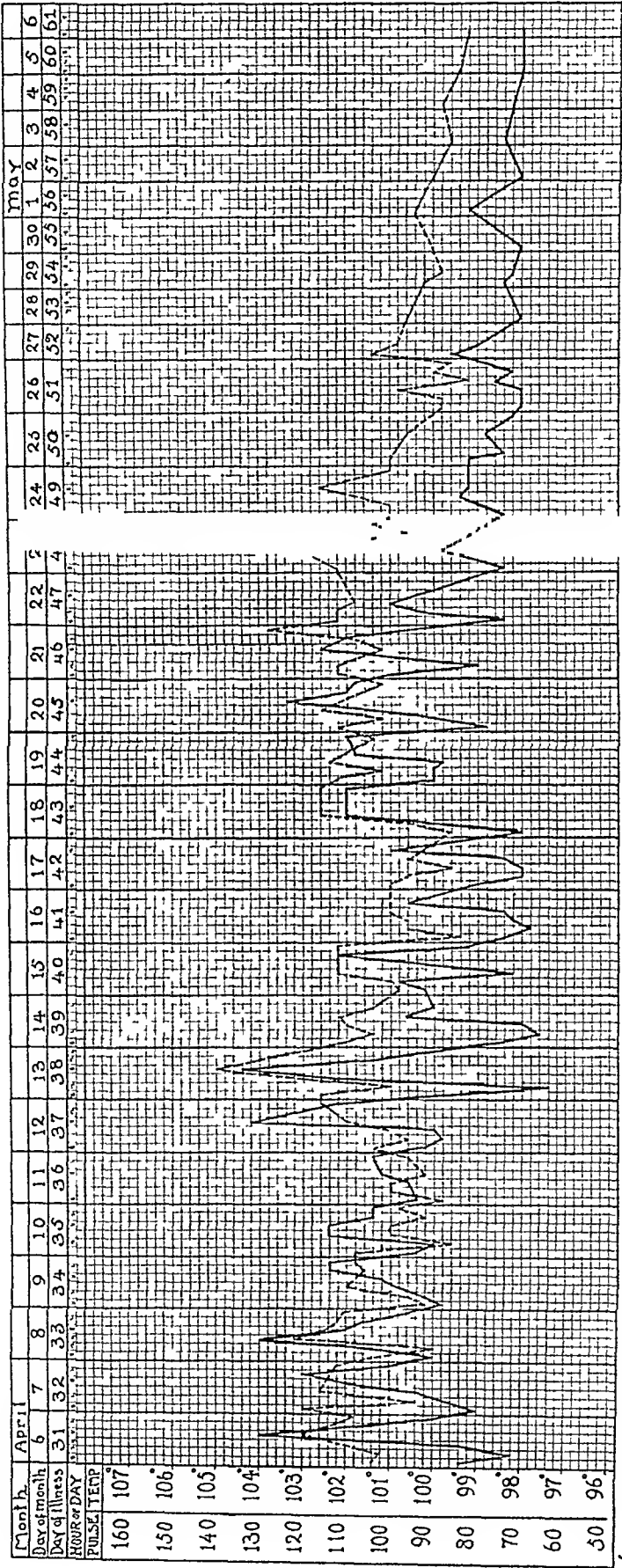


Fig. 5-B.

as a continued fever until the thirteenth day. The blood culture was taken on the tenth day and was reported as negative. The leucocytes were 24,000 with 86 per cent polynuclear cells. The intrauterine culture was not taken. On the tenth day of the fever 75 c.c. of serum was given. An almost immediate reaction necessitated the discontinuance of the injection at that amount. On the thirteenth day

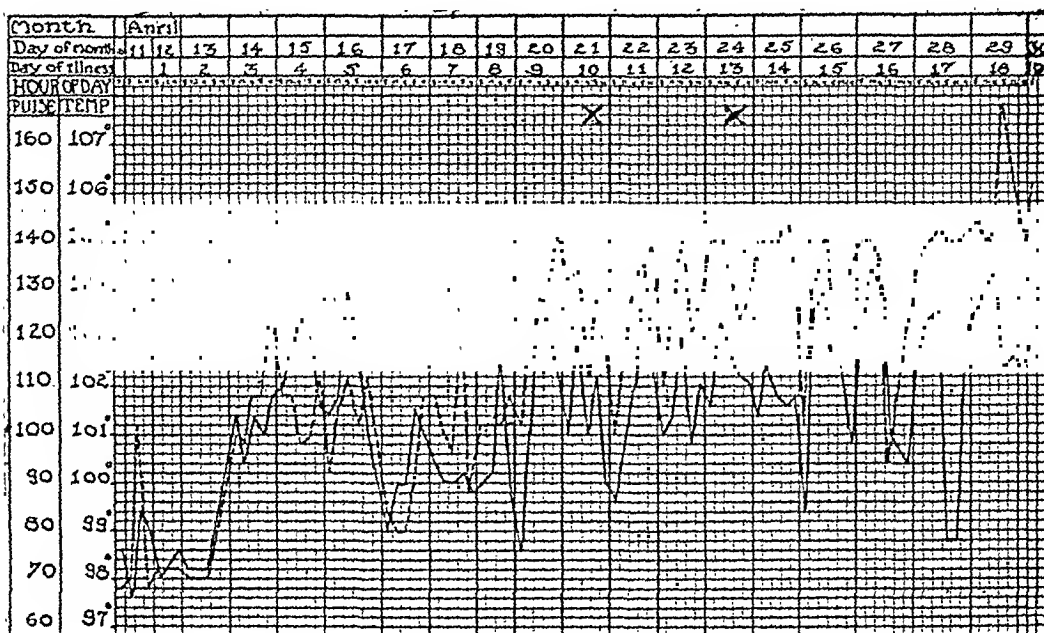


Fig. 6.

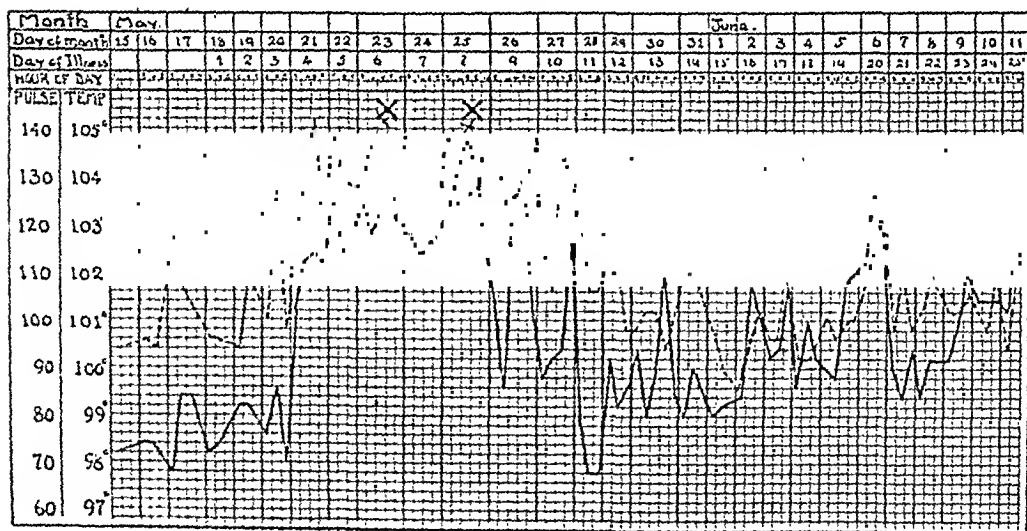


Fig. 7.

another 100 c.c. of serum was administered. The temperature dropped by lysis and the patient entirely recovered. (Fig. 8.)

S. M. K., para i, aged twenty-seven. This case had no prenatal care. She was admitted on April 1, 1922, and discharged on April 28. There were no rectal or vaginal examinations. No sutures were inserted.

The temperature rose to 102.4° on the fourth day and the following day to 104.6°. This patient had a chronic inflammation of the alveolar ridge of her mouth and

this had to be treated during her stay in the hospital. The blood culture was negative. The intrauterine culture was first reported as staphylococcus albus but later as sterile after 5 days. On the fourth day of the fever there was evidence of a double parametritis. Fifty c.c. of serum was administered after which the patient had a prolonged chill with cyanosis and shock. The temperature dropped to 97.8° with a pulse of 88. The following day the temperature rose to 104.4° . On the ninth day postpartum the leucocytes were 44,000 with 93 per cent polynuclear cells. Two days later the count dropped to 16,000 with 91 per cent polynuclear cells. On the twelfth day the temperature dropped to normal and on the twenty-first day without a rise in temperature there was an ischiorectal abscess which was opened on the surgical ward and a dram or more of pus evacuated. The patient recovered. (Fig. 9.)

4. A. F. This patient was admitted to Bellevue Hospital on February 18, 1922. She was in the first stage of labor. There were no rectal or vaginal examinations, and the delivery was spontaneous.

On the third day the temperature rose to 104.2° and remained high until the ninth day when it reached normal. On the seventh day the blood culture was nega-

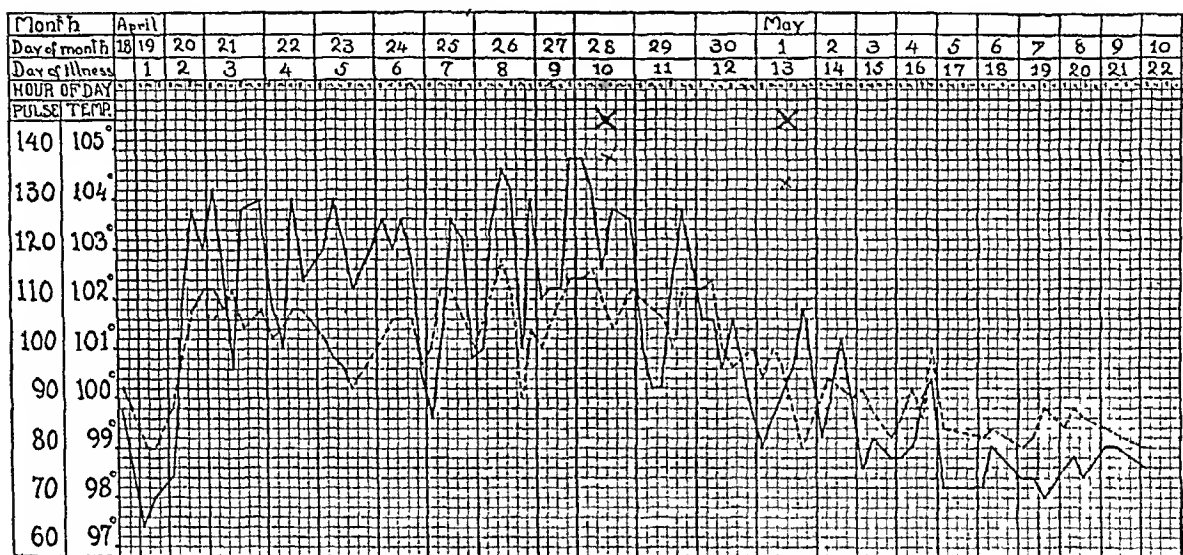


Fig. 8.

tive; one hundred c.c. of serum was given on this day and the dose was repeated on the following day. The temperature dropped almost at once and the patient gradually recovered and was discharged on March 9. (Fig. 10.)

5. M. U., para i. This patient was admitted to the Bellevue School for Midwives on March 6, 1922. She had had no prenatal care. She had a spontaneous delivery and one silkworm suture was placed in the perineum.

On the fourth day the temperature rose to 105° and remained as a continued fever until after the injection of the serum. On the fifth day of the fever 50 c.c. of serum was administered. On this day the leucocytes were 10,500 with 80 per cent polynuclear cells. The dose was repeated on the seventh day. The temperature gradually subsided to normal. The blood culture was sterile and the intrauterine culture was not taken. The patient developed a right parametritis. She was discharged on the 15th day. (Fig. 11.)

6. E. L. This patient was admitted to the Bellevue School for Midwives on February 17, 1922. She had a spontaneous delivery. A laceration of the perineum was repaired.

On the second day postpartum her temperature reached 104° and continued until

the twelfth day. On the seventh day the blood culture was taken and reported negative. On the seventh day the leucocytes were 14,600 with 88 per cent polymuclear cells. On this day the patient was given 50 c.c. of serum and immediately the temperature dropped to 100°. The following day it reached 104° and 100 c.c. of serum was given with a third dose on the ninth day. Temperature after reaching

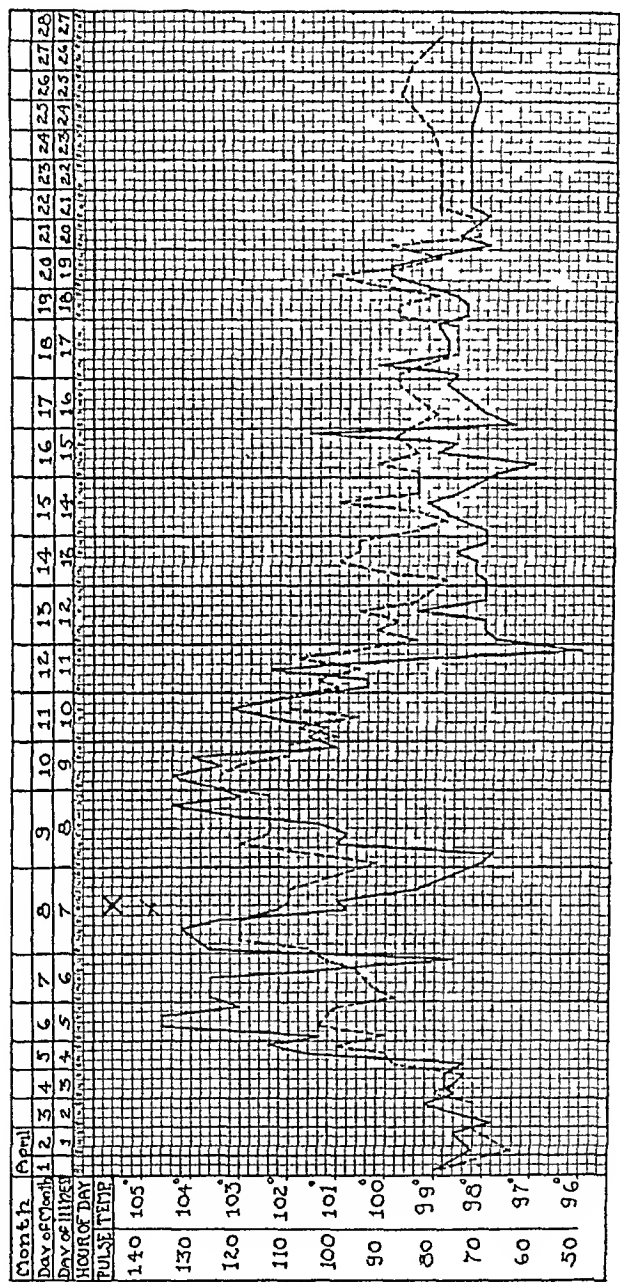


Fig. 9.

a high point of 105° dropped by lysis, reaching normal on the twelfth day. The patient entirely recovered. (Fig. 12.)

7. A. M., para 1. Admitted to Bellevue Hospital on May 5, 1922, and died there May 17. This patient had had no prenatal care. The delivery was spontaneous and no rectal or vaginal examinations were made. The perineum was repaired with silkworm and catgut stitches. The Wassermann was 4-plus.

On the third day the patient complained of a sore throat; the pharynx was congested and after a chill the temperature rose to 106°. The leucocytes were

23,000 with 86 per cent polynuclear cells. Without waiting for an intrauterine culture or a blood culture the patient was given 100 c.e. of serum on the fourth day. The temperature fell temporarily and the following day another dose of serum was given. The leucocytes were 13,200 with 84 per cent polynuclear cells. On the seventh day the third dose of 100 c.e. of serum was administered. The temperature fell by lysis and it was apparent that, while the patient was prostrated, she was improving. However, on the 11th day the pulse went to 150 while the temperature

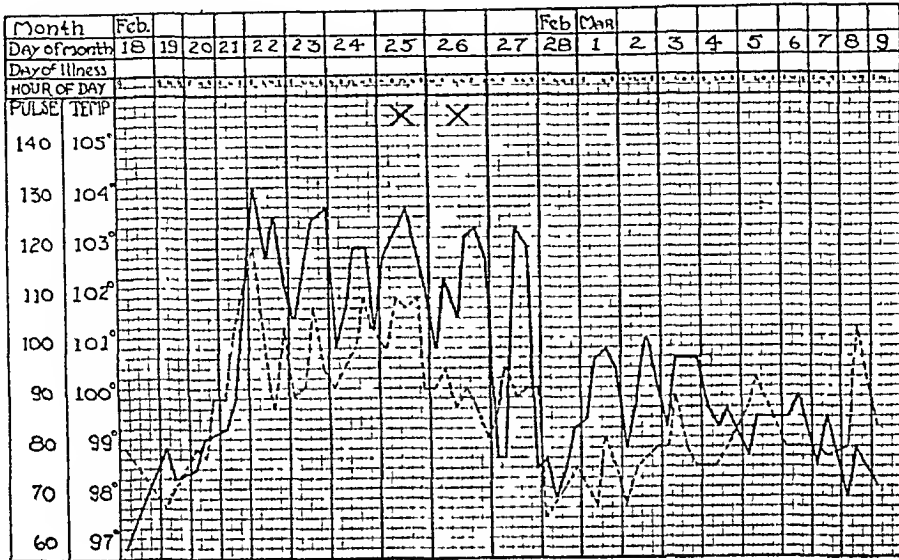


Fig. 10.

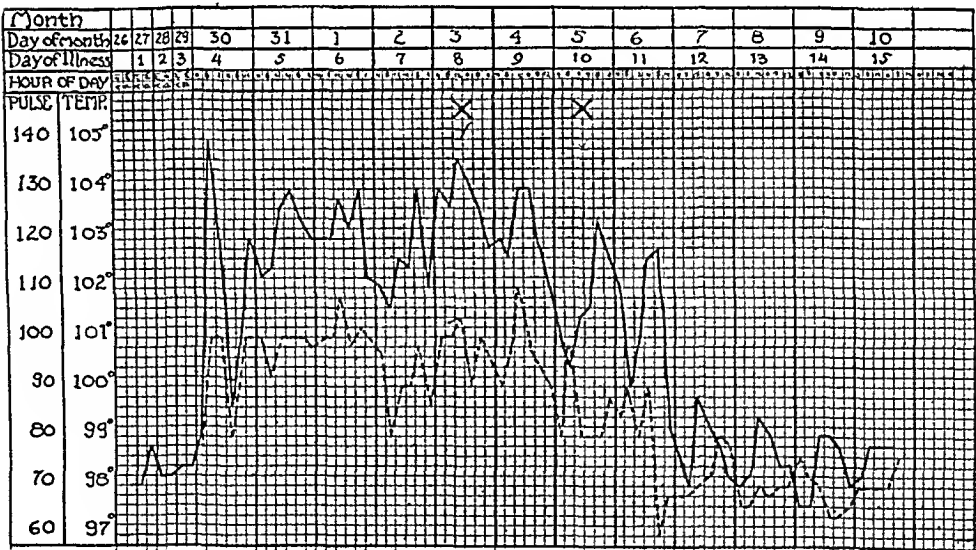


Fig. 11.

was going down. She died the following day. The temperature was 101° and the pulse 156 just before death. The day before she died the leucocytes were 23,000 with 86 per cent polynuclear cells. Possibly this patient had an embolism in her lung but no pulmonary signs were found. No autopsy was obtained. (Fig. 13.)

8. H. H., para i, aged twenty. A case from the prenatal clinic. She was admitted to Bellevue Hospital on May 9, 1922, and discharged on May 21. She returned to the Gynecological Ward on May 27 and died there June 4. The Wassermann was negative. She was admitted in labor and the delivery was spontaneous. There were

no rectal or vaginal examinations. The blood loss at the time of the delivery was somewhat above normal. There were no lacerations.

On the night of the fifth day the temperature rose, reaching 104° on the sixth day. The leucocytes were 15,800 with 82 per cent polynuclear cells and the following day they had reached 24,600 with 84 per cent polynuclear cells. One hundred

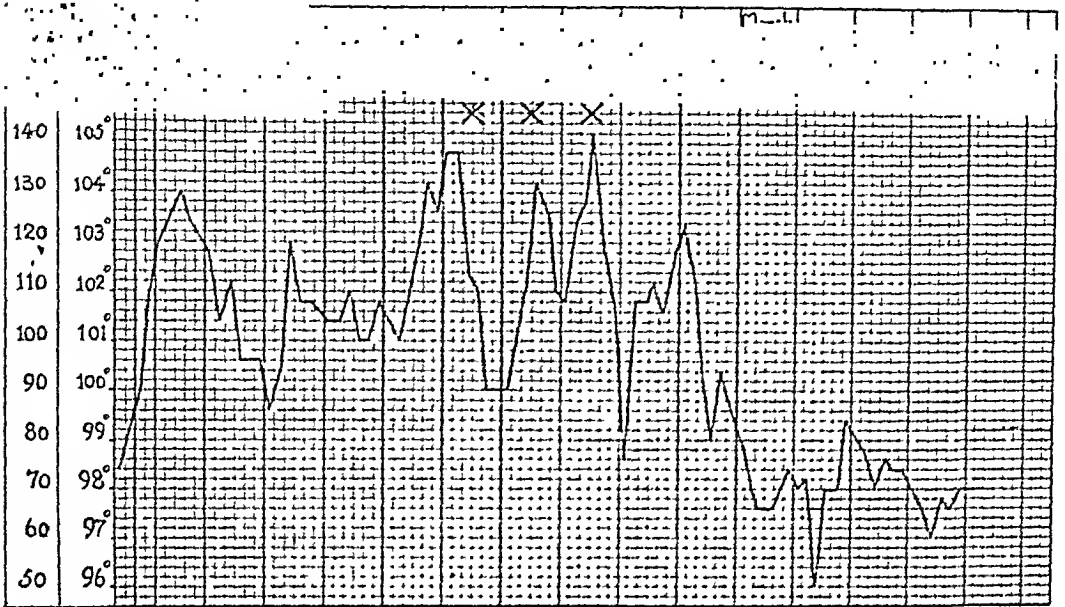


Fig. 12.

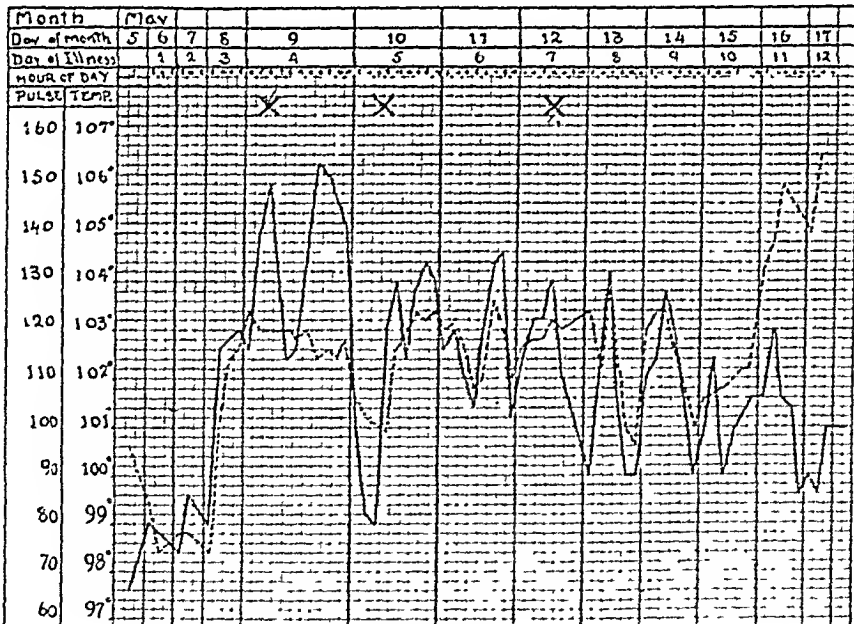


Fig. 13.

c.c. of serum was given on the 7th day, and the temperature dropped but rose again on the ninth day. Another dose of 100 c.c. of serum was given; the temperature dropped by lysis to normal. On the twelfth day the temperature reached normal and the patient had a marked parametritis on the right side. The uterus was fixed and rigid. The patient insisted upon going home notwithstanding our warning.

Six days later she returned to the Gynecological Ward with a temperature of

104°. She had an urticarial rash and considerable tenderness in the right parametrium. Serum sickness appeared on the eighth or ninth day after the second dose of serum. The leucocytes were 13,200 with 80 per cent polynuclear cells, and the red blood cells were 4,024,000. The temperature was high but intermittent, with a low point of 102° and a high of 105.4°. Two blood cultures were taken and both were negative. The patient died on the ninth day following her second admission. (Fig. 14.)

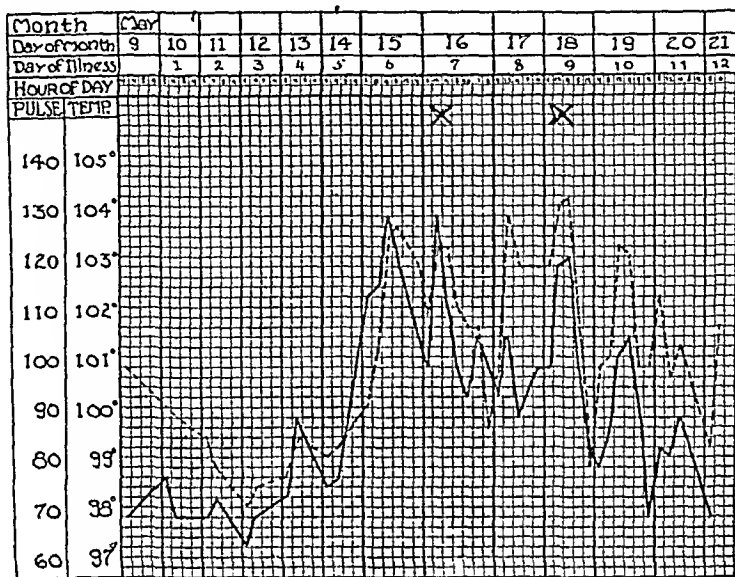


Fig. 14.

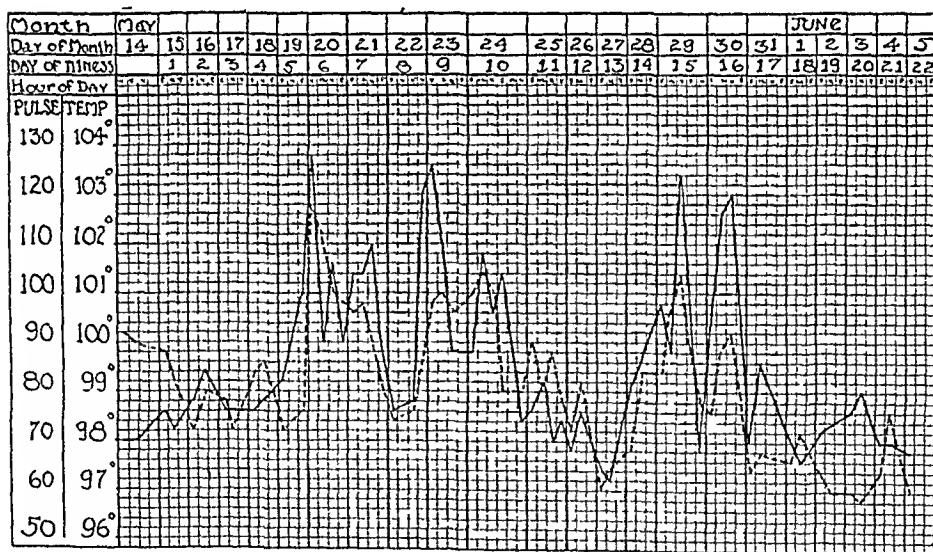


Fig. 15.

Group III.—Control Case.

1. B. D. This patient was admitted to Bellevue Hospital on March 14, 1922, and had a spontaneous delivery. No rectal or vaginal examinations were made.

On the fifth day the patient had a sore throat with considerable edema. The cultures showed streptococcus and pneumococcus. The temperature reached 103.8° on the morning of the sixth day; this condition was thought to be entirely due to the sore throat. The patient was segregated. The temperature reached normal on

the eighth day and rose on the tenth. There was a scant amount of lochia. The intrauterine culture was taken and found to contain streptococcus hemolyticus. The intradermal skin test was positive so that no serum was given. Two days later the temperature dropped to normal. There were two temporary rises on the fifteenth and sixteenth days. This undoubtedly was a case in which the infection was largely confined to the endometrium and shows that recovery may occur through the production of antibodies in the patient's own blood. (Fig. 15.)

DISCUSSION AND SUMMARY

The preparation of the serum must be efficient from a serologic standpoint. This means the proper injection of the animals with all the known procurable strains of hemolytic streptococci and the bleeding of them in order to obtain the immune serum at a time when the antigen is absent. The supply must be properly kept and it must not be too old. While these serums apparently can be reactivated as shown by Weaver and Tuncliff, especially by the addition of human serum, nevertheless there is a point at which reactivation ceases. The date as placed on the label should be an efficient guarantee that the serum is active or may be reactivated up to that day.

Desensitization must be carried out before the administration of the serum if there is the slightest doubt that the result of the dermal test is negative. With these precautions the serum may be considered as comparatively harmless, for although serum sickness appears in nearly three-fourths of the patients, this of itself, so far as we know, never produces fatalities. The usual symptoms are urticaria, joint swelling, and occasionally some edema of the throat may occur, either immediately after the injection or later on. It is true that one of our cases had a condition that simulated anaphylactic shock, but the method of administration in this case was by dilution so that the patient received in all 1,000 c.e. of the solution. Practical experience has shown us that this is not the best way of administering the dose. It is better to inject the serum very slowly without dilution. The dosage that we used might, in all cases, be termed moderate. We limited ourselves to the administration of 100 c.e. in 24 hours and when serum sickness appeared we gave no further injections. If this dose is repeated each day for three or four days, a sufficient amount may be received before the serum sickness appears. We believe that it is feasible to give more than one dose in 24 hours but we have not done so and it remains for some future observer to administer the larger doses. We believe that if the temperature rises in the postpartum period and remains above 103° for 48 hours, the dose of 100 c.e. should be given without waiting for the results of the cultures.

Parametritis occurred so regularly in our few cases that it seemed as though the serum had a tendency to localize the disease. The

serum treatment in the first days of the fever should be followed by the most careful treatment of the parametritis or the inflammation of the pelvic cellular tissues.

The mortality in the 6 cases that had positive intrauterine cultures of streptococcus hemolyticus was 16.6 per cent. In the second group, if we are permitted to discard the case that went home against advice on the first day that the temperature was down, but in the presence of a marked parametritis, and that later returned to the Gynecological Ward where she died, the mortality in the 7 cases remaining was 14.3 per cent. If we take the two groups together, 13 cases in all, the mortality was 15.3 per cent. If the death rate is uncorrected the mortality for the entire group is 21.4 per cent.

The only published statistical evidence that we have of the mortality in the recent cases in New York is the paper by Rosensohn¹⁴ in which he analyzes the bacteremia occurring in the Lying-In Hospital from 1920 to 1922. In his group there were eight proved cases of streptococcus hemolyticus with a mortality of 62.5 per cent. There were three cases of nonhemolytic streptococcus and two with the streptococcus combined with *B. coli*. If the death rate from all these streptococcus cases including the two with mixed infections is taken, there was a total of 13, with a mortality of 61.5 per cent.

This discussion can hardly be closed without again mentioning Dr. Philip Williams' four cases of postabortal hemolytic streptococcemia in which the blood cultures were positive and which ended, after the administration of the serum, in a cure in each instance.

In conclusion, it may be stated that in 14 cases of acute puerperal fever, of which 6 had positive intrauterine cultures of hemolytic streptococcus, the administration of polyvalent antistreptococcus serum was followed in 11 cases by the subsidence of the temperature and gradual recovery, giving a death rate, uncorrected of 21.4 per cent and corrected of 15.3 per cent.

The administration of the polyvalent antistreptococcus serum, under the conditions outlined in this paper, appears to be comparatively harmless and of considerable value in the treatment of puerperal sepsis.

REFERENCES

- (1) *Eichel*: Report New York Vital Statistics, Jan., 1923.
- (2) *Lea*: Puerperal Infection, London, 1910, p. 19.
- (3) *Williams*: Obstetrics, 5th edition, 1923, p. 997.
- (4) *Marmorek*: Ann. de l'Inst. Pasteur, 1895, ix, 593.
- (5) *Van de Velde and Peham*: Arch. f. Gynäk., 1904, 23—1.
- (6) *Bar and Tissier*: L'Obstetrique, 1896, i, 97.
- (7) Tr. Am. Gynec. Soc.: 1889, xxiv, 80.
- (8) *Helstorn*: Proc. N. Y. Path. Soc., 1906, vi, 29.
- (9) *Wcaver and Tunccliff*: Jour. Infect. Diseases, 1911, ix, 129.
- (10) *Williams, Philip F.*: Postabortal Hemolytic Streptococcemia, AM. JOUR. OBST. AND GYNEC., 1922, iv, 636.
- (11) *McLeod and McNece*: Jour. Path., 1913, xvii, 542.
- (12) *Denys and LaClef*: La Cellule, 1895, xi, 175.
- (13) *Neufeld and Rimpau*: Ztschr. f. Hyg., 1905, li, 283.
- (14) *Rosensohn*: Bulletin of the Lying-In Hospital, 1923, xii, 214.

THE WASSERMANN TEST

III. A STATISTICAL STUDY OF CLINICAL SYPHILIS AND FETAL DEATHS IN WOMEN WITH POSITIVE WASSERMANN REACTIONS

BY DAVID L. BELDING, M.D., AND ISABELLE L. HUNTER, B.S.,
BOSTON, MASS.

(From the Evans Memorial, Boston)

INTRODUCTION

IN a series of observations upon the Wassermann test in pregnancy at the Robinson Memorial of the Massachusetts Homeopathic Hospital, Boston, a comparative study of clinical syphilis and fetal deaths in 461 positive and 500 negative cases was made. The positive series was obtained from 5198 ward patients admitted during the years 1917 to 1920, of whom 9.2 per cent gave positive Wassermann tests. The negative series, selected for comparison, comprised the same proportion of racial and national groups, viz., American (two or more generations in the U. S. A.) 15.8 per cent, American (one generation in the U. S. A.) 40.3, Canadian 9.3, Jewish 9.1, Negro 7.2, Irish 7.4, English 2.6, Scotch 1.3, Armenian 1.3, Swedish 1.3, Greek 1.3, Teutonic 0.9, and miscellaneous 2.2. Five hundred cases are perhaps too small a number upon which to base definite conclusions but at least are sufficient to warrant a reasonable assumption of correctness.

The Wassermann tests were made with cholesterolized antigens according to the technique described by Belding and Adams.¹ All degrees of inhibition, as reported upon a 1 to 4-plus scale, were designated as positive. Separate consideration is given to strong or 4-plus positives. Unless accompanied by the prefix "Clinical" the term "Syphilis" refers to serum positive syphilis as determined by a positive Wassermann test. Since from 25 to 30 per cent of pregnant women giving positive Wassermann reactions with cholesterolized antigens are presumably nonsyphilitic, and a corresponding proportion of syphilitic women may have negative reactions, it is evident that our comparisons represent minimum rather than maximum differences. Owing to the fact that a relatively small number of positive cases received thorough prenatal antisyphilitic treatment and since many comparisons are based upon the history previous to diagnosis, the influence of treatment upon these statistics may be disregarded.

A. CLINICAL SYPHILIS IN PREGNANT WOMEN

It is difficult to obtain a history of syphilis in pregnant women. Either they are ignorant of or are reluctant to disclose their condi-

tion. The symptoms usually associated with the disease are frequently absent or unnoticed by the patient, thus producing a clinical picture different from that of the typical syphilitic. Indeed, few cases present active lesions, the prevailing type being hidden or latent syphilis. The percentage of pregnant women with positive Wassermann tests who show clinical evidence of syphilis is variously estimated according to the interpretation of different authorities as to what constitutes a clinical diagnosis. The average of ten observers is 40 per cent, and practically all agree that the percentage is relatively low. Therefore, in the routine examination of a prenatal clinic it is possible in relatively few cases to obtain direct evidence of clinical syphilis.

A positive Wassermann reaction in pregnant women may not invariably denote syphilis, and, conversely, women with clinical syphilis sometimes give a negative test. If the commonly accepted estimate of 68 per cent positive in latent syphilis is correct, the reaction in pregnant women with syphilitic histories, largely of this type, should prove negative in less than 32 per cent. The average of 27 per cent negative in pregnant syphilitic women by four European observers confirms this statement, since a few cases of active syphilis would tend to reduce the number of negative Wassermann tests. Therefore, it would seem that serologic syphilis in pregnant women, as indicated by a positive Wassermann test, is by no means synonymous with clinical syphilis, each occurring independently of the other in an appreciable number of cases.

CLINICAL CLASSIFICATION

Our two series have been grouped from the standpoint of clinical syphilis into four classes: (A) *definite*, when there is no question of the clinical diagnosis; (B) *suspicious*, when there are several suggestive symptoms but the evidence is not conclusive; (C) *suggestive*, when a single symptom or sign of the disease is present; and (D) *no indication*, when no clinical evidence can be obtained.

The classification has been based upon the clinical findings as represented by physical examination, symptoms, history of infection, abortions, stillbirths, other children, husband and present child. This arbitrary method of presenting the clinical findings in four classes has several drawbacks: e.g., the necessity of taking into consideration the personality of the writer; the preponderance of symptoms in multiparae, and the corresponding paucity in primiparae; the impossibility of selecting only those abortions and stillbirths which are due to syphilis; the vaguely suspicious signs of syphilis which may occur in nonsyphilitics; and the frequency of confusing nonsyphilitic skin lesions in newly born children.

Two groupings have been made: (1) excluding present child, com-

prising the information which may be obtained in the prenatal clinic; (2) including present child, containing the additional information obtained from a clinical study of the offspring as long as the mother and child remained in the hospital, an average of thirteen days after delivery.

TABLE I
CLINICAL SYPHILIS

	EXCLUDING CHILD NEGATIVE	CHILD POSITIVE	INCLUDING CHILD NEGATIVE	CHILD POSITIVE
Number of cases	500	461	500	461
A. Definite	0.2%	5.9%	0.2%	9.8%
B. Suspicious	4.8%	11.7%	11.8%	19.9%
C. Suggestive	15.0%	21.5%	30.0%	25.2%
D. No indication	80.0%	60.9%	58.0%	45.1%

The presence of 0.2 per cent with definite clinical syphilis and 11.8 per cent suspicious in the negative series emphasizes the fact that a negative Wassermann, particularly in hidden and treated cases, does not rule out the diagnosis of syphilis. The greater part of the suspicious cases are nonsyphilitic owing to the frequency of suspicious signs in negative women, but a few may represent syphilitics with negative Wassermann tests. Likewise, certain cases may be syphilitic and yet show neither a positive Wassermann nor clinical signs.

Classes A and B are alone worthy of consideration from a clinical or diagnostic standpoint, since a single sign or symptom of syphilis is so readily simulated by other conditions that Class C is approximately the same for both positive and negative series. Class A is unquestionably syphilitic, but Class B is a mixture of syphilitic and nonsyphilitic as indicated by the 11.8 per cent in the negative series which is due to the frequency of abortions, stillbirths, and other suspicious signs in nonsyphilitics. Naturally the nonsyphilitics included in the 461 positive Wassermann cases largely fall into the C and D classes, thus decreasing the actual percentage of the A and B classes.

Only 9.8 per cent of the positive cases gave definite evidence of syphilis and an additional 19.9 were suspicious, an increase of 9.6 and 8.1 per cent respectively over the negative series. Considering Classes A and B as presumably syphilitic and C and D as nonsyphilitic, 29.7 per cent of the positive Wassermann cases are clinically syphilitic as compared with 12.0 per cent of the negative cases. If the possibility of syphilis in the negative cases is disregarded, it would seem that the disease manifests itself clinically in 17.7 per cent of cases with positive Wassermann tests.

This clinical classification is subject to considerable modification and is markedly influenced by the following factors: (1) evidence of syphilis in the child of the present pregnancy; (2) the strength of

the Wassermann reaction; (3) the proportion of multiparae; (4) fetal deaths; and (5) race.

Present Child.—In about one-quarter of the cases, evidence of definite syphilis can be obtained only from the child of the present pregnancy. The additional evidence thus furnished gives a gain of 3.9 per cent for Class A and 8.2 for Class B. In the prenatal clinic where such data concerning the coming child is unobtainable, the difference between the negative and positive series is 5.7 per cent for Class A and 6.9 per cent for Class B, a total of 12.6, which probably represents the minimum figure.

Strength of Reaction.—Table II, which represents the findings in the prenatal clinic, shows the influence of the strength of the reaction upon the clinical classification. Contrasting the strong 4 plus with the weak 1 to 3 plus positives, differences of 8.3 and 7.8 per cent for Classes A and B are obtained, while the per cent of presumably clinical syphilitics is 25.6 for the strong positives vs. 9.5 for the weak. If the clinical findings in the present child are included, the difference is materially increased.

TABLE II
STRENGTH OF REACTION

CLINICAL SYPHILIS	NEGATIVE	POSITIVE			
		4 plus	1 to 3 plus	2 to 4 plus	All degrees
Number of cases	500	231	230	391	461
A. Definite	0.2%	10.0%	1.7%	6.4%	5.8%
B. Suspicious	4.8%	15.6%	7.8%	12.3%	11.7%
C. Suggestive	15.0%	21.2%	21.7%	21.2%	21.5%
D. No indication	80.0%	53.2%	68.8%	60.1%	61.0%

The strongly positive group includes a smaller per cent of non-syphilitics since nonsyphilitic fixation more often occurs as a weak positive. Likewise, the weak positives represent old cases in which it is more difficult to obtain clinical evidence.

It is possible to obtain evidence of clinical syphilis in strong positives in at least 20.6 per cent in excess of the negative control series at the prenatal clinic, and in 27.8 per cent when the patient leaves the hospital. Evidently about 25 per cent of strongly positive Wassermann cases may give some evidence of clinical syphilis at the prenatal clinic.

In definite syphilis, Class A, the strong positives furnish 10 per cent, the weak 1.7, and the negative 0.2, indicating that the frankly clinical cases, unless treated, tend to give strong reactions.

The cases may be classified from the standpoint of reportable Wassermanns (2 to 4 plus), such as a laboratory would designate as positive, discarding the doubtful (1 plus) reactions. As such, there is an increase to 18.7 per cent in Classes A and B, with a corresponding

drop in the doubtful positives to 11.5 per cent. Including the present child, these figures total 32.0 and 17.2 per cent respectively. A similar change is also found in the definitely positive cases, which are 2.2 times more numerous in the reportable (2 to 4 plus) than in the doubtful (1 plus) positives. In the former, one case out of every sixteen, in the latter but one case out of thirty-four gave a definite history of syphilis. In view of the fact that 2.9 per cent of the 1 plus positives gave definite syphilitic findings and 8.6 per cent suspicious, as compared with 0.2 per cent and 4.8 per cent for the negative cases, it is evident that in pregnant women all grades of inhibition should be reported by the laboratory for clinical interpretation, otherwise in routine Wassermann tests a number of syphilitics will be overlooked.

Primiparae vs. Multiparae.—In clinical comparisons, the primiparae and multiparae should be separated since in the latter the history of abortions, stillbirths, premature births and health of other children furnish considerable clinical evidence unobtainable in the former. In our series the proportion of multiparae runs 61.4 per cent for total positives, 62.3 for the strong positives, and 55.4 for the negatives, which, provided 500 cases are a sufficient number upon which to base conclusions, suggests that syphilis is more prevalent among the multiparae. This presumption seems reasonable in view of the greater possible exposure to the disease through longer married life.

TABLE III
PRIMIPARAE VS. MULTIPARAE

	PRIMIPARAE		MULTIPARAE	
<i>Clinical Syphilis</i>	<i>Negative</i>	<i>Positive</i>	<i>Negative</i>	<i>Positive</i>
A. Definite	0.5%	5.6%	0.0%	6.0%
B. Suspicious	0.9%	1.7%	7.9%	18.0%
C. Suggestive	1.3%	3.4%	26.0%	32.9%
D. No indication	97.3%	89.3%	66.1%	43.1%

In the negative series 1.4 per cent of the primiparae and 7.9 of the multiparae show a possible clinical syphilis. Correspondingly, the positive series gives 7.3 and 24.0 per cent. When the clinical findings in the child are included these figures increase to 4.5 and 18.1 per cent for the negative and 19.6 and 36.0 per cent for the positive. The increased percentage of the negative multiparae over the primiparae, approximately 5 to 1, suggests that many symptoms and signs in the multiparae simulate rather than indicate syphilis. Primiparae, therefore, afford a better comparison between the negative and positive series as regards the relative clinical findings of syphilis, but fail to give an adequate idea as to the total extent of clinical syphilis.

Class A shows a slight but uniform increase in favor of the multip-

arac for total positives, reportable positives, and strong positives, which is more marked when the additional evidence from the child is included. A similar increase is noticeable when the net gain over the negative control series is calculated. In both positive and negative series the multiparae show a great increase in Class B which is largely due to the number of nonsyphilitic fetal deaths and misleading facts concerning previous children. However, the net increase over the negative, 10.1 per cent, indicates that certain of these conditions in the multiparae are the result of syphilis.

Fetal Deaths.—The term fetal deaths includes both abortions and stillbirths. The causal relation between syphilis and fetal deaths is commonly accepted and this evidence, particularly when multiple, has been considered in our classification a sign of syphilis. The subject itself is sufficiently broad to demand separate treatment and, therefore, only that part which is concerned with the clinical classification will be considered here.

Of the negative multiparae, 33.2 per cent and of the positive 43.1 per cent gave a history of one or more fetal deaths, and correspondingly, 19.5 and 26.7 per cent of all conceptions resulted in fetal deaths. Therefore, if all fetal deaths are recorded as symptoms of syphilis, cases with nonsyphilitic fetal deaths will receive a false clinical classification. On the other hand, if all fetal deaths are eliminated the complete clinical picture will not be presented, since syphilis is directly or indirectly responsible for some 37 per cent of all fetal deaths in syphilitic women. By eliminating fetal deaths from the classification and considering only prenatal clinic evidence, the difference between the negative and positive series becomes more striking and the per cent of clinically suspicious syphilis, Class B, is greatly reduced. Only 0.6 per cent of the negative cases as compared with 9.1 and 14.7 per cent of the positive and strong positive fall into the probably syphilitic group.

TABLE IV
CLINICAL CLASSIFICATION EXCLUDING FETAL DEATHS

	NEGATIVE	POSITIVE	
		All Degrees	Strong (4 plus)
A. Definite	0.2%	5.2%	9.1%
B. Suspicious	0.4%	3.9%	5.6%
C. Suggestive	1.4%	11.0%	13.8%
D. No indication	98.0%	79.9%	71.5%

Race.—The reaction of different races to syphilis is interesting in view of the question of racial immunity or susceptibility to disease. Apparently a distinct biologic difference exists between the negro and the white races in their reaction to syphilis and less prominent demarcations occur between the various nationalities of the white race.

A comparison of the clinical findings in Americans of at least two generations, Negroes and Russian Jews, indicates considerable difference in the clinical classification.

TABLE V
INFLUENCE OF RACE

Clinical Syphilis	NEGATIVE WASSERMANN			POSITIVE WASSERMANN		
	American	Negro	Russian Jew	American	Negro	Russian Jew
Cases	200	142	200	69	27	43
A. Definite	0.5%	2.1%	0.0%	4.3%	14.9%	2.3%
B. Suspicious	5.0%	6.3%	3.5%	8.7%	25.9%	9.3%
C. Suggestive	12.0%	17.6%	13.5%	21.7%	29.6%	18.6%
D. No indication	82.5%	74.0%	83.0%	65.3%	29.6%	69.8%

The negative cases show a surprising uniformity with a slightly increased tendency toward clinical syphilis in the Negro, partly the result of a greater proportion of fetal deaths. The positive series indicates that clinical manifestations are especially marked in the negro and are least noticeable in the Russian Jew.

CLINICAL SYPHILIS

Clinical symptoms or a history of syphilis, especially when it is not primarily suspected, are difficult to obtain in the routine prenatal examination of the prospective mother owing to reticence or ignorance upon the part of the patient and to the absence of clinical manifestations. The infrequency of clinical signs of syphilis has been generally observed in both pregnant and nonpregnant women. Skinner² reports that women do not seek diagnosis or treatment at venereal clinics as early as men, owing to their lack of information concerning venereal disease and inability to recognize symptoms. Gellhorn³ finds that the for concealment and that with the exception of fever and anemia the primary lesion is smaller, less indurated and tends to clear more rapidly, that the complexity of the female genitalia offers more chance secondaries are usually more fleeting. Gaucher⁴ notes that the primary lesion cannot be demonstrated in 33 to 37 per cent of women while Polak⁵ and Beck⁶ conclude that the clinical history is of little use in the detection of syphilis in pregnant women. Therefore, it seems that clinical signs of syphilis in women, especially the primary lesion, may be absent or if present easily overlooked, in contrast to the more noticeable symptoms in men.

Sufficient evidence is not at hand to indicate whether syphilis in the pregnant woman differs from the nonpregnant since comparatively few cases of recent infection are found in routine obstetric examinations, the majority having contracted the disease previous to the present conception. Brown and Pearce⁷ find that pregnant rabbits react differently from nonpregnant to experimental infection and that

this condition persists during the greater part of the lactation period. Evidently clinical syphilis is not only difficult to detect in women, but is particularly so during pregnancy.

Clinical syphilis in the pregnant woman may be determined by (1) symptoms, (2) history, (3) syphilis in the husband, (4) evidence in previous children and (5) congenital syphilis in the child. Only the first four sources are available at the prenatal examination, and of these there is little opportunity to obtain evidence of the disease in the husband or previous children. Consequently the prenatal examination is almost entirely limited to the physical examination and history of the patient.

The age, duration of married life, and a history of fetal deaths, although not in themselves diagnostic, furnish valuable confirmatory evidence and frequently the sum total may be sufficient to warrant a presumptive diagnosis. When arranged in five-year groups the percentage of the positives increased with age and duration of married life possibly owing to longer exposure to the common source of infection, the husband. The average age is 26.16 years for the negative and 26.52 for the positive cases. The average period of married life is about two months longer and the percentage of multiparae is greater for the positive than for the negative, 61.4 vs. 55.4.

The following tabulation of 60 definite syphilitic findings, in 44 cases shows the relatively small per cent, 0.95, of pregnant women who furnish direct clinical evidence of the disease. One other case not included here has been classed in our tables as definitely syphilitic because of the sum total of evidence.

TABLE VI

CLINICAL SYPHILIS	CASES
Symptoms in mother	5
History in mother	12
Husband	2
Previous children	1
Present child	11
Symptoms and previous children	1
History and husband	1
History and previous children	2
History and present child	4
Husband and present child	2
History, husband and present child	2
Symptoms, husband and present child	1
	44

In these 44 cases clinical syphilis was noted 60 times as follows: symptoms in mother, 7; history in mother, 21; husband, 8; previous children, 4; present child, 20. In 11 cases, 25 per cent, the diagnosis was made from congenital syphilis in the child with no definite

syphilitic sign except a positive Wassermann test in the mother. In the 33 cases where the diagnosis was made excluding the present child 9 had syphilitic children, although one-half had received antepartum treatment.

From the standpoint of the examining obstetrician with the prenatal clinic it would seem that the most fertile sources of information were (1) the history of the mother, 52.5 per cent; (2) the history of syphilis in the husband, 20 per cent; (3) clinical symptoms in the mother, 17.5 per cent; and (4) previous children, 10 per cent. If means were available for thorough investigation of each case, the husband and previous children would show a marked increase. Therefore, special attention should be paid in history taking to previous symptoms and treatment, and presumptive evidence in the form of fetal deaths should be carefully considered.

Symptoms.—Of 461 positive cases but 1.5 per cent gave definite clinical symptoms of syphilis in the mother and 1.3 gave suspicious, a meager total of 2.8 per cent. Since the patients were given a routine examination without special reference to syphilis, these figures are minimum but they emphasize the fact that insofar as the mother is concerned the type of syphilis is hidden. Twenty-two women showed symptoms directly or remotely referable to syphilis. Of these 7 were definitely and 6 suspiciously syphilitic, the remaining 9 presenting only headaches or gonorrhea. Unless accompanied by other reliable information headaches are of little importance and may be disregarded as a clinical sign owing to their frequent occurrence in other conditions. A greater number was found in the negative than in the positive series, 21 as compared with 12 cases, and in both instances where headaches were the only symptom there was no serious effect upon the offspring.

Unless infection occurred during the later months of pregnancy, it would be manifestly impossible in the prenatal clinic to detect the primary lesion. Active secondary lesions also are rarely found. Only four cases gave clearly defined secondary skin eruptions, while two others showed suspicious skin lesions. The negative cases gave one definite and one suspicious secondary. One case gave tertiary skin symptoms; two cases were definite neurosyphilis, and two others showed suspicious signs of neurosyphilis, in the form of neuritis and paralysis. The negative series contained one suspected case of aural syphilis.

History.—In 500 negative women one gave a definite history of syphilis, although four admitted gonorrhea. In 461 positive cases 21, 4.6 per cent, gave a definite and 11, 2.3 per cent, a suspicious history. In the 21 cases of definite syphilis, the average time between the discovery of the infection and the present confinement was five years,

the shortest one year, and the longest thirteen. Seven infections occurred within 2 years, 14 within six, 18 within nine and 21 within thirteen. The form in which syphilis was reported by the 21 patients was primary 14.3 per cent, secondary 52.4, neurosyphilis 9.5; and, through treatment alone 23.8. Eight cases had received treatment, of which one was in the primary, and two in the secondary stage, while five had no idea as to the stage of the disease. The examiner in the prenatal clinic, therefore, should pay special attention to a history of previous treatment and secondary manifestations.

Husband.—A definite history of syphilis in the husband was obtained in only 8 cases, 1.7 per cent, which is to be expected, owing to ignorance of the patient, concealment on the part of the husband, and the difficulty of obtaining an admission from either wife or husband. Our records of Wassermann tests on the husbands are few owing to the frequent refusal of the husband to submit to the test and the reluctance of the wife to tell her husband of her condition. However, negative Wassermann tests frequently occur in husbands of clinically syphilitic women or in fathers of syphilitic children.

Of the positive husbands 2 gave clinical symptoms and treatment, 2 a positive history and treatment, 1 clinical symptoms, positive Wassermann and treatment and 8 a positive Wassermann only. Three questionable luetic husbands were also noted but definite syphilis was not proved. Of the 8 positive husbands, 4 wives gave positive histories, 3 of whom had a single abortion and one 2 abortions and a stillbirth, while 4 showed no indication of the disease except 3 had abortions. Only 50 per cent showed definitely clinical evidence or history of infection, although all eight wives gave a strong (4 plus) Wassermann. Six children, 75 per cent, were definitely syphilitic and 2 were suspicious. Of the 8 husbands, 5 received more or less treatment, 3 were untreated. Of the 5 husbands treated, 4 children were syphilitic and one died of hemophilia neonatorum; while of the 3 untreated one child had snuffles, and two died of clinical syphilis. The three questionable cases gave two negative children and one syphilitic child.

In spite of the small number, these figures are significant. Either the infection of the wife occurred before the institution of treatment or treatment of the husband alone proved ineffective in preventing the transmission of the disease to mother and child. The high rate of syphilitic children, over 75 per cent, is especially striking, and warns the obstetrician where there is a history of syphilis in the husband, always to give antepartum treatment if there is the slightest suggestive clinical evidence or a positive Wassermann reaction of any degree in the prospective mother.

Previous Children.—In 674 conceptions in 283 multiparae with positive Wassermann tests, 180 fetal deaths occurred and 494 children

were born, of which 96 died within the first few years of life. Little information could be obtained relative to these dead children and suspicious findings were noted only in 14 cases with 23 dead children. Four children died of meningitis, one definitely syphilitic, one tuberculous and two unknown, but presumably syphilitic. Two of the four mothers were clinically syphilitic. In six cases which gave a history of early death in two to four children, only one mother was clinically syphilitic. In four cases where a child died during the first months of life, one mother was clinically syphilitic. Of the 398 living children only 23 gave a history of any trouble. Two had definite congenital syphilis, two had infected fingers and toes, two had infected mucous membranes, two had snuffles, two had snuffles and skin lesions, and thirteen had skin lesions in the form of rash, pustules and sores. As a rule information regarding previous children is so indefinite that it is of little value in the detecting of syphilis.

B. THE RELATION OF SYPHILIS TO FETAL DEATHS

In this paper the term, "fetal death," includes both abortion and stillbirth, because in history taking it is frequently impossible to distinguish between the two. Arbitrarily, the delivery of a fetus which has not reached the stage of viability at the twenty-seventh to twenty-eighth week is termed an abortion, and one that has reached this stage but in which cardiac action has ceased during or before delivery is classed as a stillbirth. Statistics from maternity hospitals, where many patients are not under observations until the later months of pregnancy, are accurate in respect to the number of stillbirths but give no adequate idea of the number of abortions, which can be obtained only from the previous history of the patient.

Reproductive Power.—In our statistics which deal with pregnant women whose average age is about twenty-six years, the number of previous conceptions is 1.22 for the negative, 1.46 for the positive and 1.64 for the positive cases which had definite clinical syphilis. The difference, if any, lies in favor of the syphilitic series, irrespective of whether considered from the standpoint of the total cases, total multiparae or multiparae with a history of fetal deaths. Hata⁸ states that 40 per cent of positive Wassermann women, married three years, do not become impregnated and concludes that syphilis is an important factor in the production of sterility. Our statistics, although not directly comparable since all the patients were pregnant, indicate that while syphilis may produce sterility it has no appreciable check upon the number of conceptions in women in whom fecundation is possible. Jeans⁹ in a compilation of 881 positive and 350 negative cases from the literature finds no appreciable difference between the average number of conceptions in the syphilitic, 4.71 and the nonsyphilitic, 4.89.

Productive Power.—The productive power is measured by the ratio of the living children to the total conceptions. Although Table VII shows that the average number of conceptions is greater for the positive series, the average number of living children is lower. The difference in the percentage of living children between the negative, 69.7 and the positive, 59.1 is not as striking as the figures of 76.1 and 54.7 compiled by Jeans⁹ for 1712 pregnancies in nonsyphilitic and for 1538 in syphilitic families. Nevertheless it definitely shows that serum-positive and more particularly clinical syphilis has an appreciable effect upon the productive power.

TABLE VII
SYPHILIS AND PRODUCTIVE POWER

	NEGATIVE	POSITIVE		CLINICAL SYPHILIS
		ALL DEGREES	STRONG (4 PLUS)	
Number of multiparae	277	283	144	30
Average conceptions	2.20	2.38	2.25	2.47
Average living children	1.53	1.41	1.19	0.73
Average fetal deaths	0.43	0.64	0.71	1.33
Total number of conceptions	610	674	325	74
Per cent living children	69.7	59.1	52.7	29.7
Total children born alive	491	494	223	34
Per cent dead children	13.4	19.4	23.3	35.3

Syphilis also increases the number of early deaths in children born alive. Our 13.4 per cent for the negative series agrees with the 15.0 for 1489 nonsyphilitic children compiled by Jeans,⁹ but our 19.4 per cent for the positive is considerably lower than his 30.2 for 1366 children of syphilitic families, which is only exceeded by our 35.3 for clinically syphilitic mothers. These comparisons indicate that our statistics which deal with positive Wassermann tests in pregnant women are not comparable with clinical syphilis studies and at best represent minimum figures as to the effect of the disease.

INCIDENCE OF FETAL DEATHS

The incidence of fetal deaths may be obtained from the previous history of patients and from the records of maternity hospitals. If the mortality in the last months of pregnancy including parturition were as great as in the first six, statistics from these two sources would agree, but since it is estimated that a relatively small proportion of fetal deaths occur during the later period, results are not directly comparable. Furthermore, since syphilis as a causative factor is more in evidence in the last months of pregnancy, the statistics of maternity hospitals should furnish more reliable information as to the effect of this disease.

History of Fetal Deaths.—Table VIII indicates that 33.2 per cent of 277 negative multiparae, averaging 26.16 years of age and 2.2

TABLE VIII
HISTORY OF FETAL DEATHS

	CASES				CONCEPTIONS			
	NEG- ATIVE	POS- ITIVE	STRONG POSITIVE (4 PLUS)	CLINICAL SYPHILIS	NEG- ATIVE	POS- ITIVE	STRONG POSITIVE (4 PLUS)	CLINICAL SYPHILIS
Multiparae	277	283	144	30	610	674	225	74
Fetal Deaths								
Number	92	122	67	21	119	180	102	40
Per cent	33.2	43.1	46.5	70.0	19.5	26.7	31.4	54.1
Increase over negative		9.9	13.3	36.8		7.2	11.9	34.6

previous conceptions, have a history of one or more fetal deaths, whereas 1148 cases obtained from four sources in the literature give 30.7 per cent. Six hundred and ten conceptions in these women resulted in 119 fetal deaths, or 19.5 per cent. Similarly seventeen investigators of fetal deaths, irrespective of, or excluding, syphilis, average 18.2 per cent ranging from 7.7 to 33.3. In women with a history of fetal deaths 40.3 per cent of 280 conceptions resulted in fetal deaths while seven investigators of such families report 46.1 per cent.

Of 283 women with positive Wassermann reactions averaging 26.52 years of age and 2.38 previous conceptions, 43.1 per cent gave a history of fetal deaths as compared with 36.6 per cent of 231 syphilitic cases from four sources in the literature. The strongly positive and the clinically syphilitic cases showed a still further increase. In round numbers in every 100 multiparae 33 would give a history of fetal deaths if the Wassermann test were negative and 10 more if positive, or less than one-quarter (10 in 43 or 23 per hundred) would be the direct or indirect result of syphilis.

In 674 conceptions in women with positive Wassermann reactions fetal deaths resulted in 26.7 per cent, an increase of 7.2 per cent over the negative series. In round numbers our figures indicate that in every 100 conceptions 19 fetal deaths would occur if the Wassermann reaction were negative in the mother and 7 more if positive, or one-quarter (7 in 26 or 27 per hundred) of all fetal deaths in women with positive Wassermann reactions would be due to syphilis. In the same manner two-fifths (39 per hundred) of the strong 4 plus positives and two-thirds (64 per hundred) of the clinical positives would be due to syphilis.

In 8517 conceptions in syphilitic families where one or both parents were clinically syphilitic or where there was congenital syphilis in the children, reported from twenty-two sources, an average of 29.0 per cent of fetal deaths was found. If the figures of 18.2 and 29.0 per cent as compiled from the literature are approximately correct for nonsyphilitic and syphilitic families, by a similar calculation it would appear that over one-third (37.5 per hundred) of all fetal deaths in

the history of syphilitic families would be due to this disease. Since an unknown number of children were born previous to infection this figure represents the minimum effect of syphilis. The 37.5 per hundred, which corresponds with the 39 per hundred for our strong positives, adds further evidence that our total positive series contains an appreciable number of nonsyphilitics. This point is further demonstrated by the 64 per hundred of fetal deaths resulting from syphilis in women with a definite clinical history as well as a positive Wassermann reaction.

Hospital Fetal Deaths.—Table IX gives the percentage of fetal deaths and children dying within two weeks in three maternity hospitals. The statistics from the New England Hospital for Women and Children and the Massachusetts Homeopathic Hospital are taken from their respective reports for the years 1917 to 1920 inclusive and the Johns Hopkins Hospital figures from Williams.^{10, 11}

TABLE IX
HOSPITAL FETAL DEATHS

HOSPITAL	LOCATION	TOTAL	PER CENT		
		DELIVERIES	FETAL DEATHS	DEAD CHILDREN	TOTAL
(1) New England Hospital for Women and Children	Boston	3187	3.30	3.26	6.56
(2) Massachusetts Homeopathic Hospital	Boston	6564	3.66	3.31	6.97
(1) and (2)	Boston	9751	3.54	3.29	6.83
(3) Johns Hopkins Hospital	Baltimore	14000	...	...	7.14
Total		23751	...	...	7.04

Since the three hospitals exercise the same skill in treating patients the difference is probably due to the class of patients and the number of emergency cases. At the Johns Hopkins Hospital where about one-half of the hospital population consists of negroes the rate is 5.14 for the white and 9.40 for the negro patients. Since negroes comprise less than three per cent of the patients at the two Boston Hospitals the statistics for whites at the three hospitals would be 6.56, 6.97 and 5.14 respectively. Unless exact information in regard to the social and economic status of the patients were obtained, comparisons between these hospitals would be futile. For practical purposes an average of 6.83 per cent may be accepted for the Boston Hospitals, of which slightly over one-half, 3.54, are fetal deaths. These figures include about 9 per cent of women with positive Wassermann reactions.

Statistics from 29 cities in the United States in a total of 487,985 registered deliveries in 1922 give an average of 4.35 stillbirths per 100 deliveries, which perhaps gives a better representation of the coun-

try than the more limited group in the two Boston Hospitals. Lack of uniformity in reporting and defining stillbirths in part accounts for the variation in the different parts of the country. Deliveries numbering 576,172 in Boston between 1891 and 1921 give an average of 3.57, a lower figure than the country as a whole. Eliminating the syphilitics, the Boston rate would probably fall to 3.22. In our selected series of 500 women with negative Wassermann reactions the rate was 3.6 and for 5960 negative women at Robinson Memorial 3.41.

Three investigators report 5.6 per cent of stillbirths in 1536 deliveries in syphilitic families, a figure which is probably too low since syphilis was not always demonstrable in the mother. Our positive series of 461 cases gave 6.1 per cent, which may be slightly high since it includes a few abortions. Our figures indicate that in every 1000 deliveries 36 stillbirths would occur in nonsyphilitics and 61 if the Wassermann test were positive, or two-fifths (25 out of 61 or 41 per cent) of all hospital fetal deaths in women with positive Wassermann reactions would be due to syphilis. Similarly in the strong 4 plus positives and the clinical syphilitics, which give 78 and 200 per thousand, one-half (54 per cent) and four-fifths (82 per cent) of all hospital fetal deaths will be due to syphilis.

Approaching the subject from the standpoint of fetal deaths and children dying in the hospital, our negative series of 500 cases gave 6.2 per cent and 5960 negative women at the hospital gave 6.74. Recalculating Williams'¹¹ figures, 1742 nonsyphilitic white women gave 5.0 per cent and 97 syphilitic 12.4, while our 461 positive women showed 9.1 per cent. Therefore, Williams finds 2.5 times as many fetal deaths and dead children in the syphilitic cases as in the nonsyphilitic, while our figures indicate only 1.47 times. Our strong positives and clinical positives which show 9.96 and 24.0 per cent respectively give 1.61 and 3.87 times.

SYPHILIS AS A CAUSE OF FETAL DEATHS

It is commonly considered that fetal deaths due to syphilis occur chiefly in the last half of pregnancy. If comparatively few syphilitic abortions occur in the first six months of pregnancy the proportion of syphilitic fetal deaths will be lower for the entire gestation period than for the last months, where the competing factors are largely the complications of labor, malformations in the child and toxic conditions in the mother. For this reason the percentage of fetal deaths due to syphilis should be lower when taken from the past history of patients than from hospital records, especially since in the former, infection may have taken place subsequent to an undetermined number of births. Our statistics indicate that 27 per cent of all fetal deaths in women with positive Wassermann reactions may be directly or indirectly at-

tributed to syphilis as compared with 41 per cent of hospital fetal deaths.

In statistics relating to the causes of fetal death considerable difference is found between the various groups. The lower the social scale the less complicated seems the mechanism of labor. Fetal and infant mortality varies with different races. Economic and social pressure may produce a higher proportion of induced abortions, both criminal and therapeutic. Lack of prenatal care and skilled attendants at delivery tend to increase the mortality. At all events statistics dealing with different social and racial groups are not suitable for comparative purposes.

Abortions.—If the statistics in the first part of this paper are approximately correct, fetal deaths result in 18.2 per cent of all conceptions irrespective of syphilis, and stillbirths occur in 3.4 per cent of births at maternity hospitals. Since practically all hospital cases are near the completion of pregnancy it appears that 14.7 per cent or four-fifths of all fetal deaths occur before the seventh month of pregnancy.

It is more difficult to determine accurately the relative causes of abortions than those of stillbirths owing to the number of induced abortions which most frequently occur between the beginning of the second and end of the fifth month, following the first realization of her condition by the pregnant woman. Owing to the natural reticence of women and physicians upon this subject it would seem that the average of 16.7 per cent of induced abortions in 623 cases reported by four investigators might be an underestimation. The causes of abortion are classed by Meyer¹² as accidental 8.7 per cent, induced 26.9, therapeutic 24.7, associated diseases 21.4 and other causes 18.3; and by Dougal and Bride¹³ as accidental 18 per cent, induced 20, constitutional 25, syphilis 10 and undetermined 27.

The surprisingly small rôle played by syphilis is due to the difficulty of accurate diagnosis, the infrequency of the disease and the fact that its maximum activity is not evident until the later months of pregnancy. Hornung¹⁴ in 30 cases of fetal death in syphilitic women found that none occurred before the fifth month, 13.3 per cent during the fifth and sixth, 50 during the seventh and eighth and 36.7 during the ninth and tenth, indicating that the infection of the child does not occur until the last half of pregnancy and that the greatest danger exists during the seventh and eighth months.

Hospital Fetal Deaths.—In compiling statistics relative to the cause of stillbirths and early deaths greater attention was given the detection of syphilis at the Johns Hopkins Hospital than at the two Boston hospitals cited above, with the result that in the latter certain syphilitic fetal deaths may have been classified under macerated fetus,

prematurity or various causes. For this reason the 28.8 per cent of syphilis in the former would appear more reliable than the 4.3 and 2.4 per cent in the latter, if it were not for the large proportion of negroes. Williams¹¹ in 302 cases of fetal and early death in a hospital found that 12.12 per cent in whites and 45.13 per cent in negroes were due to syphilis, which indicates that the incidence of syphilis as a cause of fetal deaths in the white races is considerably lower than 28.8 per cent.

TABLE X
CAUSES OF FETAL DEATHS IN HOSPITALS

	FETAL DEATHS			FETAL DEATHS AND DEAD CHILDREN			
	NEGA- TIVE	POSI- TIVE	NEW ENG. HOSPITAL	MASS. HOM. HOSPITAL	NEW ENG. HOSPITAL	MASS. HOM. HOSPITAL	J. HOP. HOSPITAL
Cases	500	461	3187	6564	3187	6564	14000
Fetal deaths	18	28	105	240	209	457	1007
Per cent	3.6	6.1	3.30	3.66	6.56	6.97	7.14
Causes by per cent							
Mechanism of labor	11.2	25.0	38.1	30.8	20.5	21.9	22.6
Condition of child	27.7	10.7	9.5	22.5	28.2	33.9	14.4
Condition of mother	...	3.6	10.5	8.8	9.6	5.7	8.0
Syphilis	...	7.1	3.8	3.8	4.3	2.4	28.8
Macerated fetus	38.9	17.9	28.6	11.6	14.4	6.1	...
Various and unknown	22.2	35.7	9.5	22.5	23.0	30.0	26.2

In comparing the three hospitals, the mechanism of labor, including suffocation, dystocia and placental abnormalities and the condition of the mother, are approximately the same. The relative number of deaths due to the condition of the child, which comprises prematurity, inanition, debility and deformity, is slightly higher in the Massachusetts hospitals, and doubtless in some instances is due to unrecognized syphilis. No macerated fetuses are listed at the Johns Hopkins Hospital, while appreciable numbers, some of which may have been syphilitic, are reported at the other two. The similarity in the causes of fetal death in the positive and negative series indicates that syphilis may act indirectly by lowering the general resistance, thus rendering the fetus susceptible to conditions otherwise insufficient to produce death. The stage of the disease in the mother is an important factor in determining the syphilitic involvement of the fetus, and our observations for the most part are based on old and latent syphilis.

A macerated fetus not infrequently is considered almost conclusive evidence of syphilis. Three observers estimate that about 80 per cent of all macerated fetuses are syphilitic, while a fourth gives 25 per cent. The presence of nearly twice the number of macerated fetuses in the negative as in the positive series, raises some doubt as to the correctness of using the term, macerated, as synonymous with

syphilitic. Maceration depends not merely on the cause of death, but rather upon the length of time that the dead fetus remains in the mother. Syphilis often produces a macerated fetus, but other conditions may accomplish the same result, and the designation of syphilitic should not be applied without morphologic evidence of the disease or the presence of the *Treponema*.

Fetal Deaths Due to Syphilis.—The effect of syphilis may be shown by determining the number of syphilitics among women with a history of fetal deaths. Five investigators obtained an average of 19.5 per cent of positive Wassermann tests in 481 women with a history of fetal deaths. Four others in 354 cases of hospital fetal deaths found 21.2 per cent positive. Williams^{10, 11} in 1007 cases of fetal death or children dying soon after birth, found 28.8 per cent syphilitic by autopsy, placental examination and Wassermann test.

Approximately 895 of the 2770 multiparae who were delivered at the Robinson Memorial Hospital had a history of fetal deaths. Of this number, 122 had a positive Wassermann test, indicating that only 13.3 per cent of all cases with a history of fetal deaths were syphilitic. Approximately 183 cases of hospital fetal death occurred in 5198 women who had received Wassermann tests, of which 28 or 15.3 per cent were positive. It would seem that the incidence of syphilis in cases with fetal deaths was only slightly above the average prevalence in the community, which in this instance was 9.2 per cent.

If from one-third to one-half of all fetal deaths in latent syphilitics can be attributed to syphilis and but 13.3 to 15.3 per cent of women with fetal deaths are syphilitic, the actual proportion of fetal deaths resulting from syphilis in the vicinity of Boston must be between 5 and 7 per cent, a surprisingly low figure in view of the high percentage cited by investigators whose observations have been limited to women with clinical syphilis.

FACTORS INFLUENCING THE EFFECT OF SYPHILIS UPON FETAL DEATHS

Multiple Fetal Deaths.—The effect of syphilis is more evident in cases with multiple fetal deaths. In the negative multiparae a history of a single fetal death was obtained in 25.3 per cent and of multiple in 7.9; and in the positive multiparae in 31.1 and 12.0 respectively. Thus in women with positive Wassermann reactions, one-fifth (6 out of 31 or 19.2 per hundred) of all single and one-third (4 out of 12 or 34.2 per hundred), of all multiple fetal death cases would result from syphilis. Similarly, the statistics of Goodman¹⁵ show a proportion of 21.9 and 36.8 per hundred. The influence of syphilis is even more strikingly shown in cases with three or more fetal deaths where 82.1 per hundred are due to syphilis.

From the standpoint of total conceptions single fetal deaths occurred

in 11.5 per cent of the negative and 13.1 of the positive; and multiple in 8.0 and 13.6 respectively. Thus in women with positive Wassermann reactions, one-eighth (1.6 out of 13 or 12.3 per hundred) of the single and two-fifths (5.6 out of 13.6 or 41.2 per hundred) of the multiple fetal deaths would be due to syphilis; and in the strongly positive cases one-quarter (23.8 per hundred) and one-half (51.0 per hundred) respectively.

Previous Fetal Deaths.—The negative and positive cases with living children may be divided into two groups according to the presence or absence of previous fetal deaths. In the negative series, 92 cases with 161 conceptions, with a history of one or more fetal deaths, show 15.5 per cent of early deaths in the living children as compared with 12.4 for 185 cases with 449 conceptions with no history of fetal deaths. In 14 cases with multiple fetal deaths a further mortality of 20 per cent in 45 children was found. Evidently mothers with a tendency toward fetal deaths are apt to produce premature or weak children. In the positive series of 122 cases with 202 children with a history of fetal deaths, a mortality of 19.5 per cent was recorded; in 161 cases with 292 children with no fetal deaths, 19.3 per cent, and in 23 cases of multiple fetal deaths, 20.8 per cent in 53 children. It would seem that both syphilis and a tendency toward fetal deaths in non-syphilitic mothers are likely to produce weak children.

The influence of a history of fetal deaths upon the production of stillbirths or death within two weeks of the present child is shown in Table XI. Irrespective of syphilis, primiparae show a definite increase over the multiparae, and multiparae with a history of fetal deaths have many more fatalities than multiparae with no history. Syphilis further increased these differences.

TABLE XI
EFFECT OF PREVIOUS FETAL DEATHS UPON PRESENT CHILD

	NEGATIVE				POSITIVE			
	PRIMIPARAE	MULTIPARAE		TOTAL	PRIMIPARAE	MULTIPARAE		TOTAL
		WITHOUT FETAL DEATHS	WITH FETAL DEATHS			WITHOUT FETAL DEATHS	WITH FETAL DEATHS	
Number of deliveries	223	185	92	277	178	161	122	283
Per cent stillbirths	3.6	3.2	4.4	3.6	7.3	3.1	8.2	5.3
Children dying within two weeks	4.0	1.1	2.2	1.4	6.2	0.6	1.6	1.1
Stillbirths and dead children	7.6	4.3	6.6	5.0	13.5	3.7	9.8	6.4

Race.—The productive capacity of the Russian Jew, American of at least the second generation, and the Negro as measured by the surviving children show marked differences. In the negative Wassermann series the Negro produced the smallest percentage of living children, 57.1; the American, 68.4, and the Jew, 71.4; while in the positive

series these figures fell to 26.0, 56.2, and 69.5 respectively, demonstrating the serious effect of syphilis upon the productive capacity of the Negro. The prevalence of syphilis in this group is 7.7 per cent for the Russian Jew, 9.1 for the American, and 16.0 for the Negro. It is interesting to note that a corresponding difference in respect to fetal deaths exists between these races.

In 200 negative women of each race a history of fetal deaths was obtained in 29.5 per cent of the Jews, 29.0 of the American and 41.4 of the Negro. Similarly, the percentage of fetal deaths to total conceptions ran: Jew, 15.2; American, 21.4; and Negro, 25.8. These differences are not due to variation in the number of conceptions, which averaged for the Jew, 2.46, American, 2.06 and Negro, 2.14, nor can they be explained by greater frankness on the part of the Negro in giving a more detailed history of fetal deaths. Consequently they may be attributed to racial differences, lack of prenatal care, or susceptibility to accidental or induced abortions.

Serum-positive syphilis increases the percentage of cases with a history of fetal deaths, Jew, 44.4, American, 42.8, and Negro, 71.4 as well as that of fetal deaths to total conceptions, Jew, 23.2, American, 33.7 and Negro, 42.0. The small number of multiple fetal deaths among the Jews reduces the percentage in both negative and positive series. In every 100 fetal deaths in women with positive Wassermann reactions, the number due to syphilis is, Jew, 34.0, American, 36.5, and Negro, 40.0.

Fetal deaths are 1.33 times as common in the negro as in the white race in nonsyphilitics, and 1.57 times in serum-positive syphilis. In every 100 conceptions in Negroes, computed on the incidence of 16.0 per cent prevalence of syphilis, 28 would result in fetal deaths, of which 7 would occur in women with positive Wassermann reactions, or 25 per cent. Correspondingly, in whites with an incidence of 8.9 per cent, 20 fetal deaths would occur, of which 2.4 or 12 per cent would be in women with positive Wassermann reactions. The ratio of whites to negroes for syphilitic fetal deaths, 1:2.08, is slightly above the 1:1.85 ratio for the incidence of serum-positive syphilis in the two races, and less than Williams'¹¹ 1:3.72 ratio for fetal deaths and children dying during the first two weeks of life.

Strength of Reaction.—The strongly positive cases invariably show a higher percentage of fetal deaths. A weak positive may indicate a treated case, syphilis of long duration, serologic idiosyncrasy on the part of the patient or a nonsyphilitic reaction, which is more frequently a weak than a strong positive. Therefore, the effect of syphilis as demonstrated in Table XII should be more pronounced in the strongly positive cases.

Clinical Syphilis.—Cases of definite clinical syphilis are 2.4 times more numerous among multiparae with a history of fetal deaths than

TABLE XII
STRENGTH OF THE REACTION

REACTION	CASES		CONCEPTIONS		CHILDREN	
	NUMBER	PER CENT WITH FETAL DEATHS	NUMBER	PER CENT FETAL DEATHS	NUMBER	PER CENT DEAD
4 plus positive	144	46.5	325	31.4	223	23.3
1 to 3 plus positive	139	39.6	349	22.4	271	16.2
Total positive	283	43.1	674	26.7	494	19.4
Negative	277	33.2	610	19.5	491	13.4

among those with no history. In every 100 fetal deaths in women with positive Wassermann reactions, 64 will be due to syphilis when there is definite clinical evidence and 16 if there is none. Even if one-half the nonclinical cases were not syphilitic, the number of fetal deaths due to syphilis could not exceed 32. Evidently clinical syphilis has a marked effect upon the birth rate, whereas latent does relatively little damage.

TABLE XIII
CLINICAL SYPHILIS AND FETAL DEATHS

	NEGATIVE	NONCLINICAL	POSITIVE	
				CLINICAL
Multiparae				
Number of fetal deaths	277	253		30
Per cent	33.2	40.0		70.0
Conceptions				
Number of fetal deaths	610	600		74
Per cent	19.5	23.3		54.1

SUMMARY

1. In the prenatal examination of 461 pregnant women who gave positive Wassermann tests with cholesterolized antigens, definite and suspicious signs of clinical syphilis were found in 17.6 per cent. When additional evidence was obtained from the child the per cent was increased to 29.7.

2. In 500 negative women of similar racial groupings 5.0 and 12.0 per cent were obtained in the same manner, indicating the impossibility of detecting all syphilitics by routine Wassermann tests and suggesting that only the differences between the negative and positive series, 12.6 and 17.7 per cent, should be considered the minimum figures for clinical syphilis.

3. Definite syphilis was found in 0.2 per cent of the negative and in 5.9 and 9.8 per cent of the positive women according to the exclusion or inclusion of evidence in the child. These low figures are due in part to nonsyphilitic fixation with cholesterolized antigens, and to the impossibility of making a thorough examination for syphilis in the rush of a prenatal clinic; but more especially are caused by the relatively small proportion of women infected with syphilis who show clinical evidence of the disease.

4. The strongly positive reactions give a higher per cent of clinical syphilis owing to the exclusion of nonsyphilitic positives and of old syphilitics in whom the Wassermann reaction is frequently weak and clinical evidence difficult to obtain. The presence of an appreciable amount of clinical syphilis in the doubtful (1 plus) cases indicates that all degrees of inhibition should be reported by the laboratory for clinical interpretation.

5. Both serologic and clinical syphilis are more prevalent among multiparae, possibly because of longer exposure and greater opportunity for obtaining clinical evidence. Owing to the numerous symptoms and signs in multiparae which simulate syphilis the primiparae give a better comparison between the negative and positive series but fail to give the full extent of clinical syphilis.

6. When fetal deaths are eliminated as symptoms of syphilis, the difference in clinical classification between the positive and the negative series is more striking, since only about one-third of fetal deaths in serum-positive syphilitics are due to syphilis.

7. Clinical manifestations of syphilis are most marked in the Negro and least apparent in the Jew.

8. In 25 per cent of the definitely syphilitic cases proof of clinical syphilis was obtained only from the child.

9. In prenatal examinations the sources of information have the following values in the detection of clinical syphilis: history 52.5 per cent; husband 20; clinical symptoms 17.5; and evidence in previous children 10.

10. Secondary symptoms, which comprise about one-half the total recorded, are the most readily recognized by both patient and physician.

11. The proportion of living children to total conceptions averages 69.7 per cent in women with negative Wassermann reactions, 59.1 in those with positive reactions and 29.7 in those with clinical syphilis. Syphilis materially lowers the productive power of the human race.

12. In 277 negative multiparae 33.2 per cent gave a history of fetal deaths and 19.5 per cent of all conceptions resulted in fetal deaths, whereas in 283 positive multiparae the corresponding figures were 43.1 and 26.7 per cent, and in 30 multiparae with clinical evidence of syphilis 70.0 and 54.1 per cent respectively.

13. Syphilis is responsible for at least one-quarter (27 per cent) of all previous fetal deaths in women with positive Wassermann reactions and for two-thirds (64 per cent) in clinical syphilitics. Similarly, from statistics compiled from the literature it appears that over one-third (37.5 per cent) of all fetal deaths in syphilitic women are due to syphilis.

14. Our statistics indicate that two-fifths (41 per cent) of all hospital fetal deaths in women with positive Wassermann reactions and four-fifths (82 per cent) in clinically syphilitic women are due to syphilis.

15. Including both stillbirths and children dying before leaving the hospital, 1.47 times as many fatalities occur in serum-positive syphilitic women as in nonsyphilitic, and 3.87 times as many in clinical syphilitic.

16. The designation of syphilitic should not be applied to a macerated fetus without morphologic evidence of the disease or the presence of the *Treponema*.

17. There are 13.3 per cent of cases with a history of fetal deaths, and 15.3 per cent of those with hospital fetal deaths give positive Wassermann tests. Since but one-third to one-half of all fetal deaths in women with positive Wassermann reactions are due to syphilis, the proportion of fetal deaths due to that disease must be between 5 and 7 per cent.

18. Syphilis is twice as frequently the cause of multiple as of single fetal deaths in women with positive Wassermann reactions.

19. Multiparae with a history of fetal deaths tend to produce more stillbirths and a greater early mortality in children born alive than those who had no previous fetal deaths. Syphilis further increases this difference.

20. Fetal deaths are 1.33 times more frequent in the negro than in the white races in nonsyphilitics and 1.57 times in serum-positive syphilitics. The incidence of syphilis among negroes with a history of fetal deaths is twice that of whites.

21. Women with strongly positive Wassermann reactions have a higher proportion of fetal deaths, 31.4, than the weakly positive, 22.4.

22. In women with clinical syphilis 64 per cent of fetal deaths are due to syphilis as compared to 16.3 in serum-positive cases without symptoms, which emphasizes the serious effect of clinical syphilis in the mother.

BIBLIOGRAPHY

- (1) *Belding, D. L. and Adams, C.B.*: Boston Med. and Surg. Jour., 1922, clxxxvii, 815. (2) *Skinner, E. F.*: Lancet, 1920, i, 650. (3) *Gellhorn, G.*: AM. JOUR. OBST. AND GYNEC., 1920, i, 81 (Discussion). (4) *Gaucher*: Jour. Am. Med. Assn., 1916, lxxvii, 574 (Quoted by Falls and Moore). (5) *Polak, J. O.*: AM. JOUR. OBST. AND GYNEC., 1920, i, 81 (Discussion). (6) *Beck, A. C.*: AM. JOUR. OBST. AND GYNEC., 1921, ii, 416. (7) *Brown, W. H. and Pierce, L.*: Am. Jour. Syph., 1920, iv, 593. (8) *Hata, S.*: Internat. Jour. Pub. Health, 1921, ii, 354. (9) *Jeanes, P. C.*: Am. Jour. Syph., 1919, iii, 114. (10) *Williams, J. W.*: Jour. Am. Med. Assn., 1915, lxiv, 95. (11) *Williams, J. W.*: Bull. Johns Hopkins Hosp., 1920, xxxi, 141. (12) *Meyer, A. W.*: AM. JOUR. OBST. AND GYNEC., 1921, ii, 198. (13) *Dougal, D. and Bride, J. W.*: Brit. Med. Jour., 1920, i, 632. (14) *Hornung, R.*: Jour. Am. Med. Assn., 1921, lxxvi, 626 (abstract). (15) *Goodman, H.*: Surg., Gyn., and Obst., 1920, xxx, 368.

NATURAL IMMUNITY IN THE NEWBORN*

BY LUTHER K. MUSSELMAN, M.D., NEW HAVEN, CONN.

(From the Department of Obstetrics and Gynecology, School of Medicine Yale University.)

INTRODUCTION

CLINICAL experience has shown that human individuals differ in their resistance to disease. Not only is this statement true for adults who show a pathologic lesion, but also for adults and infants who have no impairment of physiologic function. It is possible that the resistance of the individual may be modified at any time by environmental effects or that the factors which determine resistance may have been deficient at birth. As a result of the work of Ehrlich the natural immunity which is present in the newborn is regarded as a passive immunity; acquired either by placental interchange of pre-formed antibodies, by the transmission of antibodies through the mother's colostrum and milk, or through the intervention of both agencies. In view of the fact that the methods by which this immunity is conveyed have not been thoroughly evaluated, and since a study of them might prove of importance in interpreting clinical findings, investigations were made to ascertain the comparative value and the mechanism of these processes.

Accordingly it was pertinent to determine: (1) If the antibody content of the sera of normal mothers and of their infants is equal. (2) If unequal, is the difference due to an increased efficiency of the maternal serum associated with pregnancy, or is it due to a normally low potency of the serum of the newborn? (3) If the former condition is true, at what period in pregnancy does this increased effectiveness manifest itself? (4) If the latter is true, how and when does the serum of the newborn attain a value equivalent to that of the maternal serum? In other words, what is the process by which natural immunity is developed?

A review of the literature reveals very few studies which have been conducted upon man, and of these studies by far the greater number deal with the acquisition of artificially acquired immunity, rather than with that of natural immunity. However, since the development of natural immunity in man may involve a mechanism similar to that which functions in other species, and since the acquisi-

*The material used in this paper is from a dissertation presented to the Faculty of the Graduate School of Yale University in candidacy for the Degree of Doctor of Philosophy.

tion of natural immunity may be through processes similar to those which operate in acquired immunity, a brief statement will be given of the available data bearing on these points. In order to facilitate this, the articles will be considered under the various types of antibodies which have been investigated, namely, the aggregating antibodies,—agglutinins, precipitins, opsonins—and the distintegrating antibodies, the lysins. In addition, investigations regarding other properties of sera, such as the complement, the ferments, the antiferments, and the purely chemical constituents, will be considered.

I. *Agglutinins*.—Among the various individuals examined by Grünbaum⁴³ to show the value of the agglutinative reaction for enteric fever, there were three cases of normal parturient women and their newborn. He observed that the mother's serum, even if diluted, possessed marked agglutinative properties for *B. typhosus* and the cholera vibrio, but that the serum of the newborn failed to show any action on *B. typhosus* and, in one instance only, showed a weak agglutinative action on the cholera vibrio. He concluded that the agglutinins of the blood were not inherited but were formed by the child in later life. Halban⁴⁴ found that the maternal serum possessed a greater agglutinating ability for rabbits' red blood cells and for bacteria than did the serum of the newborn. In a few cases, the serum of the newborn contained no trace of agglutinin. He was of the opinion that the chorionic epithelium of the placenta manifested a selective action in absorbing constituents from the maternal blood, and that the agglutinins should be considered as both innate and acquired, the former type being apparently independent of the mother. Schumacher⁴⁵ reported a series of forty-five cases in which he compared the agglutinating ability of the blood of normal (no history of typhoid infection) mothers and their newborn for *B. typhosus*. The undiluted sera of all of the mothers agglutinated the organisms and twenty-two of them continued to show this property in the dilution of 1 to 50. The undiluted sera of sixteen of the newborn failed to show any agglutinating ability, and in the dilution of 1 to 25 a reaction was observed with the serum of but one infant. In the cases where the serum of the newborn possessed this agglutinating property, it was always of a lower value than that of the corresponding maternal serum. Halban and Landsteiner⁴⁶ found that the agglutinating ability for rabbits' red blood cells was always greater in the maternal serum than in that of the newborn. In comparing the action of inactivated rabbits' serum on the red blood cells of mother and infant Schenk⁴⁸ found the maternal cells to be less susceptible to agglutination than those of the infant. According to v. Graff and v. Zubrzycki,⁴² and to v. Zubrzycki and Wolfsgruber,¹⁰⁹ hemagglutinins were almost uniformly absent from the serum of the newborn, although they were present in the maternal serum, v. Fellenberg and Döll³⁵ tested the agglutinins of mother and newborn for the staphylococcus, *B. coli*, *B. typhosus*, the paratyphoid bacillus and the cholera vibrio. In twenty-five cases the serum of the newborn contained more agglutinins than that of the mother, but in a few cases it showed little or no agglutinating power, while in thirty-seven cases the maternal serum possessed this property to a higher degree. The fact that the serum which showed a higher agglutination with one organism had a higher agglutinating power for the others suggests the nonspecificity of the reaction bodies involved. With heterohemagglutinins the maternal serum was always of a higher value than that of the newborn. Kraus and Löw³⁸ showed that the serum of newborn guinea pigs lacked agglutinating power for *B. coli*, although the serum of the mother possessed this property even in the dilution of 1 to 20. These results were confirmed by the

work of v. Eisler and Sohma.³² Park⁷³ believed that the blood of young animals was comparatively free from bacterial agglutinins. Huddleson⁵⁰ was unable to find any relationship between the agglutinins of aborted fetuses and their dams, between pregnant cows and their fetuses, or between newborn calves and their dams, and concluded that agglutinins (also complement-fixing antibodies) were not transmitted from mother to fetus in utero. Reymann⁸⁰ tested the agglutinative action of the serum of goats and of their newborn kids for *B. typhosus*, *B. coli*, and for the red blood cells of the horse and rabbit. Although present in the maternal serum in the fourteen cases, agglutinins were demonstrable in the serum of but one of the kids.

Specific Agglutinins. (A) *B. typhosus*.—The examination of the body fluids of fetuses which were aborted by typhoid patients prior to the sixth month of pregnancy failed to reveal any intrauterine transmission of agglutinins. (Etienne,³³ Charrier and Apert,¹⁹ Dogliotti.²⁴) On the other hand, the serum of fetuses prematurely delivered because of a similar infection contained agglutinins. (Chambrelent and Saint-Phillippe.⁸¹) The serum of a premature infant of seven months' gestation, born seven weeks after the mother's recovery from typhoid fever, showed less agglutinating ability than the serum of the mother. (Mossé and Daunic.⁷⁰) Another infant of similar age, born during the third week of typhoid fever in the mother, showed a high agglutinating ability (Scholtz⁹²). This property of the serum probably depended upon an intrauterine infection of the fetus, and not upon an actual transmission of agglutinins from the mother. A nine months' infant, born during the course of typhoid infection of the mother, showed agglutinins to about 1/10 the value of the maternal serum (Schumacher⁹³). Infants, born of mothers recently recovered from typhoid fever, showed agglutinins in their sera (Castaigne,¹⁶ Courmont and Cade²²). In cases where the mothers had typhoid fever from two to twenty-one years prior to parturition, the maternal serum and milk showed agglutinins, but the infant's serum did not (Kasel and Mann⁵³). A mother, who developed typhoid fever while still nursing her child, showed agglutinins in the milk, but the infant's serum was negative (Achard and Bensaude²).

The offspring of rabbits, inoculated with typhoid bacilli six days prior to parturition, showed some agglutinins but less than the maternal sera (Widal and Sieard¹⁰⁷). Guinea pigs, immunized during pregnancy, transmitted agglutinins to the offspring, the value of their sera being less than the maternal, but this property disappeared from the serum of the young within a few months (Remlinger⁷⁸). Guinea pigs, which were immunized before the beginning of pregnancy, bore young which later developed a higher agglutinating ability than the mother (Jurewitsch⁵²). Agglutinins seemed to be equal in fetal and maternal sera if immunization was carried out one to two months prior to parturition, but if performed later in gestation the value of the fetal serum was less than that of the maternal (Staübli⁹⁹).

A goat, immunized late in pregnancy, gave birth to a kid which died without suckling. The maternal serum and milk showed a high content of agglutinins, but the serum of the kid failed to show any agglutinins whatever (Schumacher⁹³).

(B) *B. abortus*.—The sera of newborn calves usually did not contain any agglutinins until the animals had suckled, although the sera and colostrum of the mothers were rich in these antibodies (Little and Orcutt⁶⁴).

(C) *V. cholerae*.—Guinea pigs, immunized during pregnancy, transmitted the antibodies to their young (Achard,¹ Dieudonné²³).

(D) *B. proteus*.—Guinea pigs, which were immunized during pregnancy, transmitted the antibodies to their offspring (Achard¹).

Hemagglutinins.—Goats, which were immunized to the red blood cells of the sheep, failed to transmit any antibodies to the kids (Kraus⁵⁷). Guinea pigs and rabbits, immunized to sheep's red blood cells, showed about the same concentration in the maternal and fetal sera (Bourquoin¹¹). In man, the hemagglutinins have long been recognized as being of significance in the determination of blood groups. It is also known that in children the blood group is not usually established at birth, but makes its appearance after a period varying from a few months to a year. When it does appear, it may or may not be that of the mother. Obviously, in these instances where the maternal and filial groups differ, there has not been a transmission of hemagglutinins as such from the mother to the offspring and it is equally impossible to consider that the reaction bodies which characterize the group could have been conferred upon the child through the milk.

II. *Precipitins.*—Specific precipitins against human blood serum were found in the serum of the offspring of rabbits which were immunized during pregnancy (Merkel⁶⁶). Dogs, which were immunized to horse and cow serum, gave birth to young that failed to show any precipitins in their sera at the end of four weeks, even though precipitins for these antigens were demonstrable in the milk of the mothers (Bertarelli⁸). In view of the assumed relationship between precipitin and the anaphylactic antibody, it is pertinent to mention that passive sensitization from mother to offspring has been noted by Rosenau and Anderson,⁸⁵ Friedemann,³⁸ Otto⁷² and other investigators.

III. *Opsonins.*—Wright and Douglas¹⁰⁸ and, later, Much⁷¹ found that the opsonic power of the sera of the newborn was equal to that of the maternal sera. Turton and Appleton¹⁰² showed that the opsonic index of the serum of infants several days old, was lower than that of the maternal serum, and the work of Wells¹⁰⁰ demonstrated that the value of the opsonic index of infants decreased during the first few days of life, but later increased. He concluded that healthy breast fed infants possessed no "advantages" over healthy artificially fed infants, and that the antibacterial defense in children was not dependent upon the opsonic content of their sera. This opinion agrees with that of Amberg,⁴ who believed that the increased opsonic power of the breast fed infant was dependent to some extent upon its state of nutrition. v. Eisler and Sohma³² found that opsonin did not appear in the fetal guinea pig until the last third of pregnancy; that it reached the normal value at birth; and that in both rabbits and guinea pigs the opsonins of the newborn were the same as in the mother. Flaminio³⁰ observed that the opsonins were lower in artificially fed infants and concluded that they varied with the weight of the child. Cathala and Leuquex¹⁷ showed that the opsonic index of the blood of the newborn was slightly less than that of the adult, and that it diminished during the first days of life. Tunnicliff¹⁰⁰ found the opsonic index approximately equal in the mother and the newborn. The opsonic value of the infant's serum fell rather rapidly during the first few months of life, and it required nearly two years to regain the adult value. This investigator showed also that the phagocytic activity of the infant's leucocytes followed the same curves, but a longer period was required to reach the adult value. Sherman,⁹⁴ in his studies upon swine, found that opsonins increased with the age of the fetus; and that prior to birth the value of the fetus was slightly lower than that of the maternal animal.

IV. *Cytolysins.*—(A) *Bacteriolysins.*—Halban and Landsteiner⁴⁵ concluded from one experiment with the cholera vibrio that the bactericidal action of the maternal serum was greater than that of the newborn. Schenk⁸⁰ found that the bactericidal action varied in adults, but, in the three cases examined, the action of the maternal serum against *B. typhosus*, *B. coli*, the cholera vibrio and *Staphylococcus albus* was

always greater than that of the serum of the newborn. Variable results were obtained by v. Fellenberg and Döll.³⁵ The sera of their cases were tested especially against the cholera vibrio, although a few were tested against the paratyphoid bacillus. Sometimes the value of the maternal serum was higher than that of the newborn, while in other cases it was lower. They concluded that these antibodies were not transferred from mother to fetus.

(B) Hemolysins.—Resinelli⁷⁹ was the first to show that fetal serum contained less hemolysin than the maternal serum. Halban and Landsteiner⁴⁵ found in all instances that the hemolytic action of the maternal serum for rabbits' red blood cells was greater than that of the serum of the newborn, and observed that the maternal serum when inactivated possessed a greater lytic action for the red cells than the inactivated serum of the newborn. They concluded, therefore, that the newborn possessed all of the serum constituents, but in a lesser degree than the mother, the lessened serum properties being associated with a somewhat lowered resistance to infection. They were of the opinion that it was desirable to investigate at what time and in what way in extrauterine life the change of the serum (newborn) takes place. From his investigation of six cases, Sehenk⁸⁸ concluded that the maternal serum contained about four times as much hemolysin for rabbits' red blood cells as did that of the newborn. Moreover, when the sera were inactivated the value of the maternal serum was always greater than that of the newborn. Polano⁷⁷ held that the blood of infants rarely contained hemolysin. v. Fellenberg and Döll³⁵ believed that natural hemolysin was not transmitted from mother to offspring, and that at birth the fetus, as concerns its normal antibody formation and cell chemistry, is a separate individual and not dependent upon its mother. Kopf⁵⁶ found that the serum of the newborn calf lacked hemolysin for guinea pigs' red blood cells, but that hemolysin was present on the fourth day of life and soon reached the titer of the maternal serum.

The transfer of an artificially acquired antibody from immunized mothers to their offspring has likewise been investigated. Goats, which were immunized to the red blood cells of cattle (Kreidl and Mandl⁵⁹) and to the red blood cells of sheep (Krans,⁵⁷ Famulener³⁴) usually failed to transmit hemolysin to their offspring, but, when the antibody was found, the titer of the kids' sera was very low. As the value of the kids' sera rose after suckling, and as the colostrum possessed a very high hemolytic value, Famulener³⁴ concluded that the sera of the newborn acquired their increased hemolytic action directly from the ingested antibodies. Bertino⁹ noted that rabbits immunized before conception failed to transmit the lysins to their offspring, while Howell and Eby⁴⁹ found less hemolysin in the serum of the newborn than in that of the immunized maternal rabbits. Bourquoin¹¹, on the other hand, in rabbits and guinea pigs immunized to sheep's red blood cells, obtained approximately the same values in maternal and fetal blood. Bertarelli⁸ failed to obtain any transmission of immune hemolysin in sheep.

Antitoxins.—Experiments have been carried out on the transfer of antitoxins from mother to offspring. Not only have the antitoxins from the bacterial toxins been investigated (Ehrlich and Hübener,²⁷ Römer,⁸⁴ Anderson,⁵) but those for the plant toxins (Ehrlich²⁶) and for the snake venoms (Fraser³⁷) have been studied. There is a uniform agreement that antitoxic immunity is transmitted in utero. However, the rapid disappearance of these antitoxins from the blood of the newborn suggests that the process is a purely passive heterogenetic immunization, and indicates that it results from the placental transfer of the antitoxin rather than from a transfer of the toxin. But it must be added that the injection of pregnant guinea pigs with antitoxic horse serum brings about an antitoxic immunity and at the same time a horse serum sensitization.

Antiferments.—Haiban and Landsteiner⁴⁵ demonstrated that the maternal serum possessed a stronger antiferment action than the serum of the newborn. Likewise, Becker⁷ noted that the titer of the serum of the newborn was lower than that of the maternal serum, although the value of the latter was raised during pregnancy. Gammeltoft³⁰ corroborated this finding for man, but did not obtain similar results with cows and rabbits. On the other hand, Reymann⁸¹ noted that the sera of newborn kids were of a higher titer than the maternal sera, the value of which was usually increased during pregnancy.

Antilysins.—Antilysins for the bacteriolysins have been measured for such organisms as *B. megaterium*, the staphylococcus and *V. cholerae*. For the antivibrolysin the antilytic value of the serum of the mother and of the offspring was equal (Schenk,⁸⁸ Reymann⁸²). Similarly, Schenk⁸⁸ reported equal values for the maternal and fetal sera for the antistaphylolysin. For the antimegathieriolysin (Reymann⁸²) and the antistaphylolysin (Polano,⁷⁷ Reymann⁸²), the value of the maternal serum was higher than the serum of the offspring.

Complement.—In view of the fact that complement is necessary for the activation of many of the antibodies which may play a rôle in the processes of immunity, numerous investigators have associated individual immunity with the amount of complement in the blood. Buchner^{13, 14, 15} termed the protective substance of the blood "alexin," and Bordet¹⁰ showed that "alexin" was not increased by the process of immunization. As the latter investigator obtained similar results in working either with bacteria or red blood cells, Ehrlich and Morgenroth^{28, 29, 30, 31} attempted to explain the phenomena of bacteriolysis by a study of hemolysis. They concluded that hemolysis was due to the combined action of a heat sensitive and a heat stable substance. The former corresponds to "alexin," is not specific and is not increased by the process of immunization; the latter, "amboceptor," is specific and is increased by immunization. The heat stable substance was bound to the red blood cells and thus rendered them susceptible to the heat sensitive substance which Ehrlich termed complement.

Gozony⁴¹ showed that the serum of the rabbit at birth lacked hemolytic complement, but by the twelfth day the complementing value was the same as the maternal. Adair³ comparing the sera of mother and newborn commonly found that the content of hemolytic complement in the sera of the newborn was less than, or equal to, the maternal value, while in a few cases the value of the sera of the newborn exceeded that of the mother. An anticomplementary substance was found in a few of the sera of the newborn which did not show any complement. From observation of the infants' weight curve, temperature chart, development of jaundice, etc., he concluded that there was no apparent relation between complement and nutrition, but that there appeared to be a relationship between hemolytic complement and immunity, as indicated by febrile reactions in the newborn.

Complement fixing antibodies.—Rosencrantz⁸⁶ noted in a series of 100 cases that 31 newborn children showed tuberculous antibodies in their sera, but no attempt was made to associate these findings with the incidence of tuberculosis among the mothers. Cooke²⁰ found that the serum of infants, at birth, possessed complement fixing substances, and the findings in these sera agreed very closely with the results obtained with the sera of the mothers taken several months after parturition. The substances disappeared from the infants' blood stream by the third month. Hence, he considered that the antibodies were transmitted from mother to child through the placenta, rather than through the milk. Likewise Ribadeau-Dumas, Cuel and Prieur⁸³ demonstrated that children born of tuberculous parents had in their sera antibodies which disappeared within one to three months.

SUMMARY OF REVIEW

With one exception the results of the investigations of the content of normal agglutinins show that the maternal serum is always of a higher value than the serum of the newborn. In some cases, the newborn failed to show any appreciable amount of this antibody. On the other hand v. Fellenberg and Döll³⁵ found in 25 out of 62 cases that the value of the serum of the newborn was greater than the maternal. However, they, as well as Grünbaum,⁴³ Halban⁴⁴ and others, were of the opinion that the newborn was independent of the mother for its antibodies.

There is considerable variation in the results of the cases which were examined for specific agglutinins. Fetuses which were aborted by women ill with typhoid fever, failed to reveal any trace of agglutinins. Infants born during a typhoid infection of the mother showed agglutinins, but always of a lesser value, while infants born of women who had typhoid fever prior to gestation, failed to show any agglutinins. Guinea pigs and rabbits which were immunized against *B. typhosus* or the cholera vibrio during pregnancy, gave birth to young which possessed some agglutinins, but less than the mothers. No transfer of this antibody was obtained in the goat. Infants born of tuberculous women, usually showed some antibody content in their sera. Hemagglutinins were not transmitted by sheep to the offspring, but guinea pigs and rabbits showed about the same concentration in the maternal and fetal bloods.

The content of bacteriolysins was found to be higher in the maternal serum than in that of the newborn, with the exception of a few of the cases examined by v. Fellenberg and Döll.³⁵ Human maternal serum was found by all to possess a higher content of hemolysins than the serum of the newborn, which in some instances failed to show any appreciable amount. Immunized goats usually failed to transmit any hemolysin to their offspring. Rabbits and guinea pigs which were immunized during pregnancy, showed about the same value in the maternal and fetal blood. However, Howell and Eby⁴⁹ found a lower content of hemolysin in the serum of the offspring of rabbits as compared with the maternal serum. In the serum of the offspring of sheep or rabbits which were immunized before conception, no hemolysins were found.

The results of the investigations of the content of opsonins in the serum of mother and newborn are in agreement. The value of the serum of the newborn was about equal to that of the maternal serum; it fell within the first few days of life, but subsequently rose. With reference to precipitins, the human maternal serum was always of a higher value than that of the newborn. The offspring of immunized

dogs failed to show any precipitins in their sera, but precipitins were found in the sera of the offspring of immunized rabbits.

The antiferment action was found to be greater in the human maternal serum than in that of the newborn, but in such animals as the goat, cow and rabbit, different results were obtained. In goats the content of antilysins was found to vary with the type of antilysin measured.

It is impossible to correlate all of the findings reported by the various investigators. It is conceivable that one species of animal transmits antibodies, both natural and acquired, to the offspring, while another species does not. It may be that placental transmission of antibodies is dependent upon the type of placentation; but it is difficult to understand why different results were obtained in the same species. Obviously, such factors as the species of animal, the nature of the antibody investigated, the method, and in cases of immunization both the nature of the antigen as well as the time and degree of immunization, must play important rôles. Clinical experience has shown that if a mother has developed an infection such as typhoid fever or small-pox in the latter months of pregnancy, the child is more likely to show evidence of such an infection than if the disease had occurred during the early months of gestation. In view of these diverse opinions, it was important to repeat some of the experiments and to perform others, to determine if possible how the newborn obtains its antibodies.

EXPERIMENTAL WORK

The antibody content* of the serum of normal mothers and their newborn may be determined by estimating the content of agglutinins, hemolysins, opsonins, precipitins, or bactericidins. It has been shown that the agglutinin titer of an individual's serum is not proportional to his resistance to a given disease; that hemolysins vary in the same species; and that, as our methods of determination are not very accurate, opsonins vary considerably. For these reasons, it was decided that a determination of the bactericidal action of the serum, that is, the ability of the serum to bring about the death of pathogenic organisms, would be the best single criterion from which to judge resistance or immunity (natural).

The experimental work in this paper is divided into the following sections:

1. The determination of the bactericidal action of the blood sera of mother and newborn.
2. Similar determinations upon the sera of men, of nonpregnant women, and of women in various months of pregnancy.
3. Complement titrations upon the sera of mother and newborn.

*The term "antibody" is used in the sense of "reacting body," and may or may not be synonymous with "immune body."

I. The Determination of the Bactericidal Action of the Blood Sera of Mother and Newborn

A. *Technic.* (a) *Method of securing specimens.*—The blood of the newborn was obtained from the umbilical cord following delivery, but before the placenta had separated. The cord was dried with a sterile gauze sponge, painted with tincture of iodine, and the specimen was obtained by puncture of one of the cord vessels with a sterile needle, or the cord was cut through this sterilized area and the blood collected in a sterile glass tube. The maternal blood was obtained from an arm vein at approximately the same time and under aseptic conditions. The majority

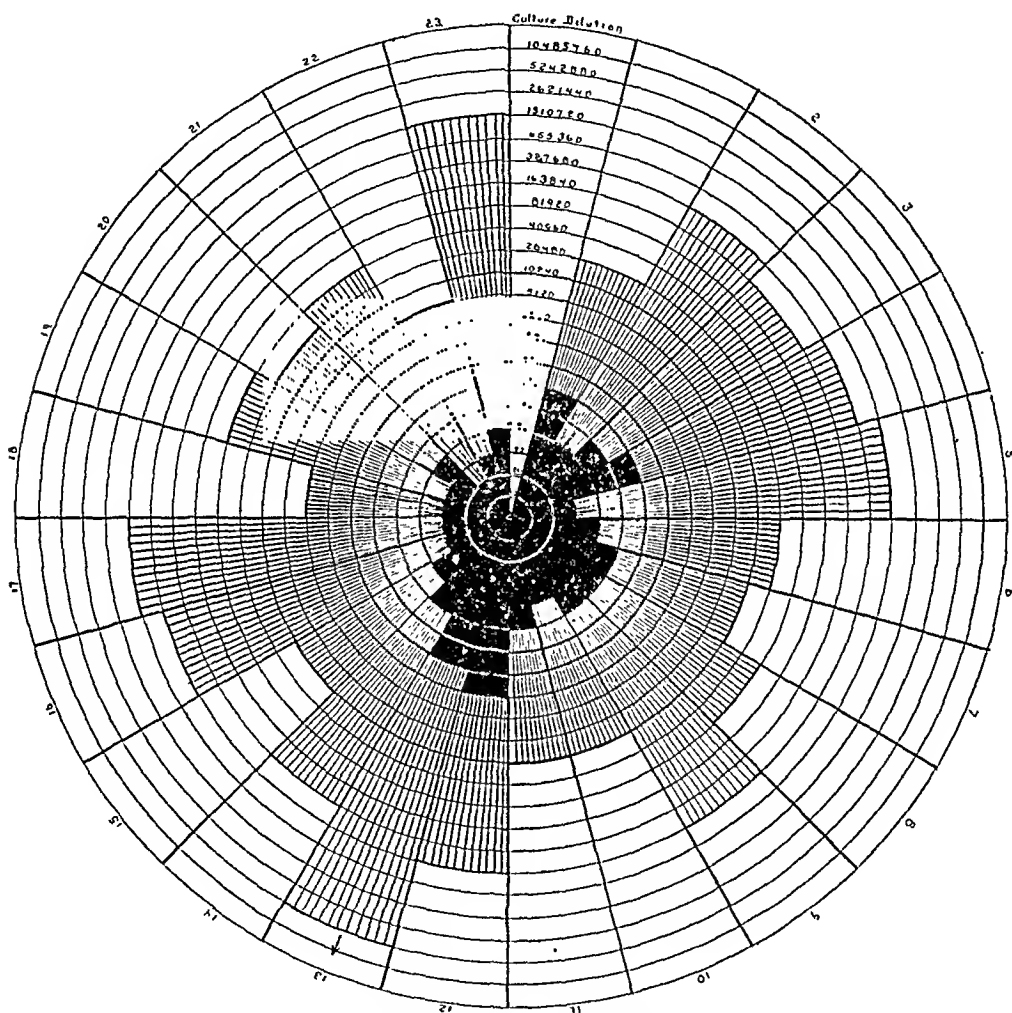


Chart 1.—The comparative values of the bactericidal action of the sera of mother and newborn. The solid area indicates the bactericidal value of the maternal sera while the radii indicate that of the sera of the newborn. Example, in Case 1 the maternal serum permanently inhibited bacterial growth in the culture dilution of 1:640 while the serum of the newborn did not show this property until the culture was diluted 1:40,960.

of the specimens, which were kept in the ice box until utilized, were tested within a few hours after they were obtained, and none of the specimens was more than 14 hours old. The native, unheated serum was separated by centrifugalization, and was not diluted for the tests.

(b) *Preparation and standardization of culture dilutions.*—An 18 hour broth culture of a strain of *B. typhosus* was diluted 1/10, 1/20, 1/40, 1/80 etc. for the tests. Agar plates each containing one-tenth of a cubic centimeter of

TABLE I

CASE	GRAVIDA	DURATION		DELIVERY	ANESTHETIC	CHILD		WEIGHT ON		REMARKS
		OF LABOR	OF LABOR			SEX	BIRTHWEIGHT	DISCHARGE		
1*	8	12 hours	Spontaneous	None		M	2765 gm.	2835 gm.	Antilutic treatment for 5 years, Wassermann reaction still positive. (+ with alcoholic antigen.)	
2	1	5	Low forceps	Nitrous oxide and ether		F	2740	2870		
3†	7	30‡	Spontaneous	Chloroform		M	2600	2775	In 4th month of pregnancy a radical operation for unilateral mammary cancer performed. Local recurrence with palpable nodules in liver. Infant had mixed feeding.	
4†	1	15	Breech extraction	Nitrous oxide		M	2440	4420	Preclamptic toxemia; labor induced. Femoral thrombophlebitis in puerperium. Infant had mixed feeding.	
5	1	16	Version and extraction	Nitrous oxide and other		F	3345	3210	Unilateral pyelitis in 7th month of pregnancy. Infant had mixed feeding.	
6	1	8‡	Low forceps	Nitrous oxide and ether		F	3355	3190	Infant had mixed feeding.	
7	1	8	Spontaneous	lt. chloroform		M	3330	3155		
8	2	13	Spontaneous	"		F	3570	3915	Infant had mixed feeding.	
9	1	11‡	Spontaneous	"		F	2545	2735		
10	4	6	Spontaneous	"		F	3350	3525		

TABLE I—CONT'D.

CASE	GRAVIDA	DURATION OF LABOR	DELIVERY	ANESTHETIC	CHILD		WEIGHT ON DISCHARGE	REMARKS
					SEX	BIRTHWEIGHT		
11*	11	38	Version and extraction	Nitrous oxide and ether	F	3420 gm.	....	Fetus was dead when patient was admitted. Thrombophlebitis of broad ligament vessels in puer- perium.
12	2	5	Spontaneous	Nitrous oxide and lt. chloroform	F	3495	3670 gm.	
13†	1	23	Low forceps	None	M	2820	3045	Eclampsia with 6 intrapartum con- vulsions. Labor induced. Infant had mixed feeding.
14	2	9½	Spontaneous	lt. chloroform	M	2770	2810	
15	2	30	Spontaneous	"	M	2715	2910	
16	4	4½	Spontaneous	"	M	3120	3320	
17	5	7	Spontaneous	"	F	3060	3340	Mother and infant had ++++ Wasser- mann reactions.
18	1	16½	Spontaneous	"	M	3520	3820	
19	2	14	Low forceps	Nitrous oxide and ether	M	3635	3660	
20	3	2	Spontaneous	lt. chloroform	M	3230	3335	
21	4	10½	Spontaneous	"	F	3520	4105	
22	2	16	Version and extraction	Nitrous oxide and ether	M	3365	....	Infant died in 5 hours from intra- cranial hemorrhage.
23	2	5	Spontaneous	None	M	2985	3260	

*The microscopic examination of sections of these placentas and umbilical cords revealed a polymorphonuclear infiltration of the subam-
niotic connective tissue and of the vessels of the cord, which is called placental bacteremia and omphalitis respectively.

†Cases 3, 4 and 13 were in the hospital 16, 70 and 20 days respectively, due to maternal complications.

the puerperium was uneventful; that the Wassermann reactions were negative; that the microscopic examination of the placental and cord sections was negative for syphilis, placental bacteremia and omphalitis; that the infants were breast fed and that they showed no abnormality during their stay in the hospital.

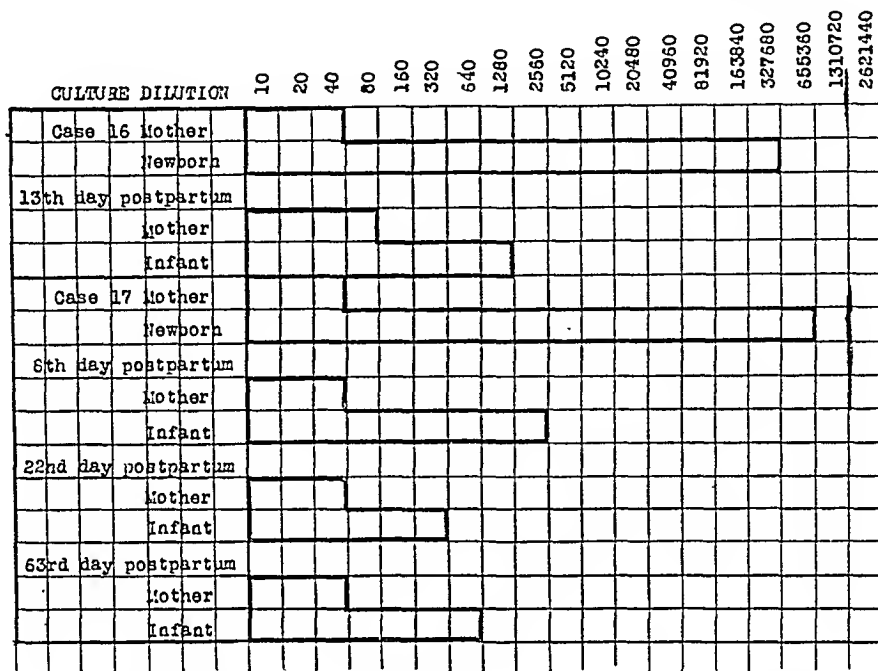


Chart 3.—The bactericidal values of the sera of mother and child at birth and later in the puerperium. In Case 16 one determination on the thirteenth day of the puerperium was made; while in Case 17 determinations were made on the eighth, twenty-second, and sixty-third days. In the former, the bacterial counts by the plate method were 2100 and 2400 colonies respectively per 1 c.c. in the culture dilution of 1:13107200; while in the latter the bacterial counts by the same method and in the same culture dilution were 2120, 2200, 2850, and 2500 colonies respectively.

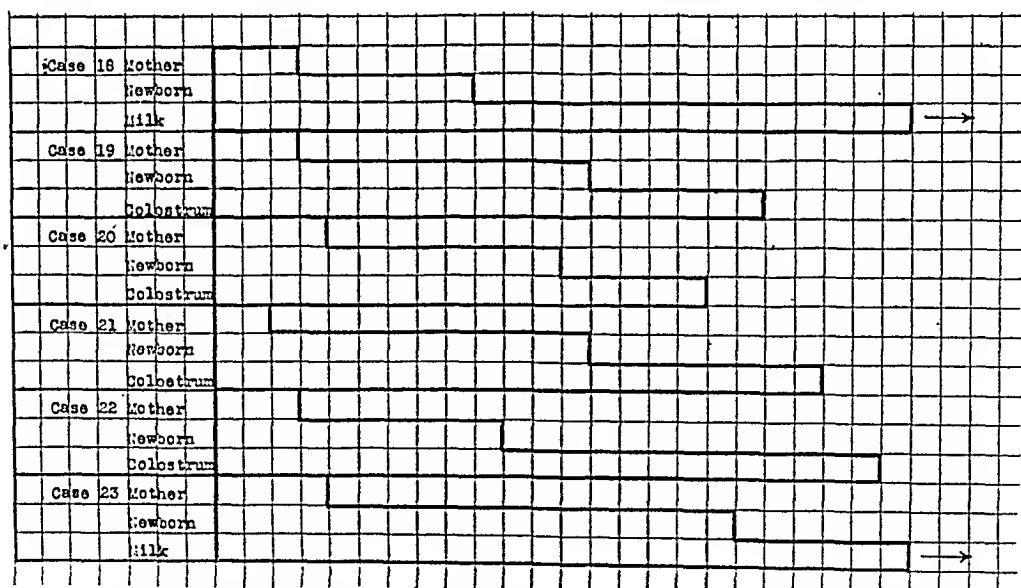


Chart 4.—The bactericidal action of the sera of mother and child at delivery contrasted with that of colostrum and milk obtained during the puerperium.

C. *Summary of results.*—In the 23 cases included in Chart 1, it is seen that the maternal serum is invariably more effective in its bactericidal or bacteriostatic action than is the serum of the newborn. However, this difference in values varies.

In general, the sera of the newborn were effective in culture dilutions from six to fourteen times those in which the maternal sera inhibited bacterial growth. This could not be correlated with any known factor such as the sex or the birth weight of the infant, the weight curve during the first two weeks of life, the nationality or multiparity of the mother, the duration or character of the labor or the administration of an anesthetic.

II. The Determination of the Bactericidal Action of the Sera of Men, of Nonpregnant Women, and of Women in Various Months of Pregnancy.

A. Technic.—The specimens were secured and the tests were performed following the method already outlined.

B. Notes on Cases.—(Table II).

C. Summary of results.—(Chart 2).

The bactericidal value of the sera was found to vary somewhat in adults. However, it can be seen that these values are approximately equal in men and in women; and that the sera of pregnant women have about the same bactericidal value as those of nonpregnant women. Hence, pregnancy in itself is not responsible for an increase in the bactericidal value of the serum.

TABLE II

CASE	SEX	REMARKS
24	male	Typhoid fever in 1906. Typhoid vaccine inoculation in 1918. Under treatment for an infection of operative area following an amputation of lower right leg.
25	"	Under treatment for cerebrospinal syphilis.
26	"	Cystitis and hematuria of undetermined origin.
27	"	Alveolar abscess of third lower molar, associated with osteomyelitis of left mandible.
28	female nonpregnant	Recovering from mild case of bronchopneumonia.
29	" " "	Myomatous uterus and cervical polyp.
30	" " "	Menorrhagia of undetermined origin.
31	" " "	Repair of old complete laceration of the perineum performed.
32	" " "	Postoperative hernia. Under treatment for syphilis, but Wassermann reaction continued +++.
33	female pregnant	Acute bronchitis in 7th month of pregnancy.
34	" "	7 months pregnant.
35	" "	2 months pregnant.
36	" "	6 months pregnant.

III. The Comparative Values of the Complementing Activity of the Sera of Mothers and Newborn

The marked difference in the bactericidal values of the sera of mother and of newborn indicates that there is a fundamental difference in the content of serum constituents. Biologic bactericidal action is usually assumed to be dependent upon the union of an antigen with its

A. Technic.

(a) *Serum*.—Some of the sera which were obtained for the bactericidal tests were used.

(b) *Amboceptor*.—The anti-sheep hemolytic system was used.

(c) *Red blood cells*.—The sheep's cells were washed and suspended in saline to a concentration of 2.5 per cent.

(d) *Method of titration*.—The native serum was diluted 1 in 5 or 1 in 10 with physiologic salt solution. Variable amounts of this dilution were tested against one unit of amboceptor and 0.5 c.c. of the cell suspension. The total volume in the tubes was made up to 2.5 c.c. with saline. They were then incubated at 37.5° C. for 20 minutes.

B. Experimental Findings.

CASE 2

TUBE	AMBOC. 1 UNIT	SERUM 1:5	CELLS 2.5%	SALINE	RESULT*	
					HEMOLYSIS MOTHER	CHILD
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	1.5 c.c.	+++	0
2	0.4	0.2	0.5	1.4	++++	++
3	0.4	0.3	0.5	1.3	++++	++++
4	0.4	0.4	0.5	1.2	++++	++++
5	0.4	0.6	0.5	1.0	++++	++++
6	0.4	0.8	0.5	0.8	++++	++++
7	0.4	1.0	0.5	0.6	++++	++++
8	..	1.0	0.5	1.0	++++	0

CASE 9

TUBE	AMBOC. 1 UNIT	SERUM 1:5	CELLS 2.5%	SALINE	HEMOLYSIS	
					MOTHER	CHILD
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	1.5 c.c.	0	0
2	0.4	0.2	0.5	1.4	++	0
3	0.4	0.3	0.5	1.3	++++	+
4	0.4	0.4	0.5	1.2	++++	+++
5	0.4	0.6	0.5	1.0	++++	++++
6	0.4	0.8	0.5	0.8	++++	++++
7	0.4	1.0	0.5	0.6	++++	++++
8	..	1.0	0.5	1.0	0	0

*++++ indicates complete hemolysis (100%)

+++ indicates marked hemolysis (75%)

++ indicates partial hemolysis (50%)

+ indicates slight hemolysis (25%)

0 indicates no hemolysis

CASE 12

TUBE	AMBOC. 1 UNIT	SERUM 1:5	CELLS 2.5%	SALINE	HEMOLYSIS	
					MOTHER	CHILD
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	1.5 c.c.	0	0
2	0.4	0.2	0.5	1.4	0	0
3	0.4	0.3	0.5	1.3	+++	0
4	0.4	0.4	0.5	1.2	++++	+++
5	0.4	0.5	0.5	1.1	++++	++++
6	0.4	0.6	0.5	1.0	++++	++++
7	0.4	0.8	0.5	0.8	++++	++++
8	0.4	1.0	0.5	0.6	++++	++++
9	..	1.0	0.5	1.0	++++	0

CASE 16

TUBE	AMBOC. 1 UNIT	SERUM 1:5	CELLS 2.5%	SALINE	HEMOLYSIS	
					MOTHER	CHILD
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	1.5 c.c.	++++	0
2	0.4	0.2	0.5	1.4	++++	++
3	0.4	0.3	0.5	1.3	++++	+++
4	0.4	0.4	0.5	1.2	++++	++++
5	0.4	0.5	0.5	1.1	++++	++++
6	0.4	0.6	0.5	1.0	++++	++++
7	0.4	0.8	0.5	0.8	++++	++++
8	0.4	1.0	0.5	0.6	++++	++++
9	..	1.0	0.5	1.0	0	0

CASE 17

TUBE	AMBOC. 1 UNIT	SERUM 1:5	CELLS 2.5%	SALINE	HEMOLYSIS	
					MOTHER	CHILD
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	1.5 c.c.	+++	0
2	0.4	0.2	0.5	1.4	++++	++
3	0.4	0.3	0.5	1.3	++++	++++
4	0.4	0.4	0.5	1.2	++++	++++
5	0.4	0.5	0.5	1.1	++++	++++
6	0.4	0.7	0.5	0.9	++++	++++
7	..	0.7	0.5	1.3	++++	0

CASE 19

TUBE	AMBOC. 1 UNIT	SERUM 1:5	CELLS 2.5%	SALINE	HEMOLYSIS	
					MOTHER	CHILD
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	1.5 c.c.	0	0
2	0.4	0.2	0.5	1.4	0	0
3	0.4	0.3	0.5	1.3	0	0
4	0.4	0.4	0.5	1.2	0	0
5	0.4	0.6	0.5	1.0	0	0
6	0.4	0.8	0.5	0.8	++++	0
7	..	0.8	0.5	1.2	0	0

As the titration of the sera of the mother and of the newborn in this case showed such a low content of complement in the maternal serum and an absence of complement in the serum of the newborn, it seemed pertinent to determine whether this finding was due to a deficiency of complement or to the presence of anticomplementary substances. The same hemolytic system was used, but a sublytic quantity of guinea pig complement was added to each tube.

CASE 19 (CONTINUED)

TUBE	GUINEA PIG COMPLEMENT		SERUM 1:5	CELLS 2.5%	SALINE	HEMOLYSIS	
	1 unit = 1.5 c.c.	AMBOC. 1 unit				MOTHER	CHILD
1	1.0 c.c.	0.4 c.c.	0.1 c.c.	0.5 c.c.	0.5 c.c.	++++	++++
2	1.0	0.4	0.2	0.5	0.4	++++	++++
3	1.0	0.4	0.3	0.5	0.3	++++	++++
4	1.0	0.4	0.4	0.5	0.2	++++	++
5	1.0	0.4	0.5	0.5	0.1	++++	++
6	1.0	0.4	..	0.5	0.6	++++	++++

The results of this titration show that the decreased hemolytic action of the maternal serum is due to a deficiency in complement, while the lack of hemolysis by the serum of the newborn depends upon the presence of anticomplementary substances.

C. *Summary of results.*—In the six cases examined, the complement titrations conform to the findings in the bactericidal tests, namely, the value of the maternal

serum is greater than that of the newborn. Although both of these serum principles stand in the same relationship between mother and offspring, there is no parallelism between them. In Case 19, the bactericidal value of the maternal serum was approximately equal to that of the other cases, but there was a deficiency of complement, as compared with the other titrations.

It appears, then, that the sera of mother and child differ in their content of complement, but the difference in the bactericidal values of the two sera cannot be explained by this factor alone, as the serum of one infant had a bactericidal action even though it did not contain any complement. It is evident, also, that certain of the maternal sera contained natural amboceptor although the sera of the offspring lacked this component.

In view of the experimental data which are recorded in the preceding sections, answers can be given to three of the questions which were asked in the introduction of this paper. The answer to the first question, namely, is the antibody content of normal maternal and newborn sera equal, is obvious. The maternal and newborn sera are not equal in their bactericidal action, and the value of the maternal serum is always much higher than that of the newborn. This result is in agreement with that of Halban and Landsteiner,⁴⁵ Sehenk⁸⁸ and other investigators.

Some variation was observed in the bactericidal action of the sera of the adults, but it was impossible to demonstrate any variation dependent upon or associated with pregnancy. The values of the sera of nonpregnant women and of men were about equal to those found in women in the various months of pregnancy or at the termination of the second stage of labor.

It may be assumed, therefore, that the difference in bactericidal action is due to a deficiency in the antibody content of the serum of the newborn and not to an increased activity of the maternal serum. This conclusion answers the questions relative to the possible explanations of the difference in the bactericidal values of the two sera, but the last question—what is the process by which natural immunity is developed?—will be considered in a following paper.

(Note.—Bibliography will be found at the end of the second paper which will appear in the August issue.)

THE DIAGNOSIS OF STERILITY IN THE MALE AND FEMALE*

BY MAX HUINER, M.D., NEW YORK CITY, N. Y.

I HAVE purposely limited this paper to *diagnosis*, as accurate diagnosis, by which I mean the discovery of the actual seat of the trouble, is essential to scientific treatment. The time is, or should be passed, when the word "sterility" was considered a diagnosis in itself, without further investigation. Just as in urinary lithiasis, we are not satisfied in saying that the patient is suffering from calculus, but we must know exactly in what portion of the genitourinary tract such calculus is, before operating. So in sterility, we must know not only whether the male or the female is at fault or both, but also we must endeavor to determine in what part of the anatomy of either sex the impediment lies, before commencing treatment.

One of the oldest methods of determining the fructifying ability of the male is the examination of a condom specimen. There is no doubt that this gives valuable information, but it has its distinct limitations which must be taken into account in making a diagnosis. These limitations will be elaborated in detail later.

The examination of a condom specimen must be performed in a definite manner or else the whole examination may come to nil. The condom after removal from the organ must be tied with a string to prevent its contents from spilling en route. This statement may seem superfluous, but experience has taught me that unless the patients are definitely instructed, they are very apt to tie the condom by making a knot with the loose part of the condom itself. This, in many cases becomes unloosened and the contents are spilled.

There are some specialists who advise placing the condom in warm water to keep the spermatozoa alive en route. I would most emphatically advise *against* any such procedure. It is true that the expert bacteriologist or chemist can tell with or without a thermometer what the temperature of the water is, but our patients are not bacteriologists or chemists, and in their endeavor to have the water hot enough, will, in the vast majority of cases, make it too hot, thus killing off all the spermatozoa. It must be remembered that while spermatozoa will stand some cold, the least amount of heat above normal will kill them immediately.

The method which I have recommended for many years is very simple and efficacious. As soon as the condom has been tied as directed, it should be placed between the warm bed pillows until

*Read at a meeting of the Harlem Medical Association, December 5, 1923.

ready for transportation. A large towel should also be placed between the same pillows. As soon as the patient is ready to come to the office, the condom should be placed within the towel and the entire package placed as near the body as possible to keep it warm during transportation. This precaution is especially necessary during cold weather.

When the specimen arrives at the office, it should not be exposed until everything is in readiness for examination. Microscope, slides, cover-glasses, etc., should all be ready. For examination of semen, only an ordinary microscope with high and low power lenses is necessary. There is no need of warm-stage apparatus, or anything else to preserve the specimen during examination. There is no special art or experience necessary for such examination, and any general practitioner should be able to examine a condom specimen.

When everything is in readiness, we may proceed to procure the specimen. I have always found that the more complicated the method, the more the specimen is poured from dish to dish, the worse the result. The only instrument I employ is a large pipette.

I untie or cut the cord with which the condom is fastened, insert the pipette, suck up the contents of the condom, allow the first drop to escape, and then deposit a drop on the slide, and cover with the cover-glass. While examining this specimen, I enclose the pipette in a towel, in order to keep it warm in case more specimens are required. Nothing can be more simple or more efficacious than this procedure.

The general appearance of the field should be noted, first using the high power. In a normal specimen, innumerable spermatozoa are at once seen dashing very rapidly about the field. Whenever one has to search for spermatozoa, it shows that the semen is abnormal. There are no two ways about it, either one sees them at once or one does not. Staining is not advisable.

If, instead of the above picture, however, we see at once many Böttcher's crystals, we can immediately decide that the semen is abnormal. In this case, the spermatozoa are either greatly diminished in quantity, or are dead, absent or moving very feebly. An occasional crystal can be seen in normal semen, and if normal semen is examined after the spermatozoa have all died, we will also find them in large quantities. It is the *early* finding of a large quantity of these crystals that stamps the specimens as abnormal.

The theory of the formation of these crystals is as follows: A moving fluid does not crystallize, or does so very slowly. In semen containing many moving spermatozoa, therefore, the crystals either do not form at all, or do so very slowly, whereas they are formed

rapidly and in large numbers in semen containing either no spermatozoa or only dead ones.

In these cases, in which repeated condom examinations, after long periods of continence, persistently show no spermatozoa at all, we have by no means done our duty to the patient by telling him he is sterile, and perhaps advising some operation on the epididymis. We must determine whether the absence of spermatozoa is due to an obstruction in the epididymi or vasa, or whether it is due to the fact that the testicles themselves do not manufacture spermatozoa, or to both conditions combined. It is perhaps unnecessary to state that the testicle has two distinct and independent functions, one, the spermatogenic function, and the other the secretion of a hormone which determines the secondary sexual characteristics of the man. Either function may be destroyed without interfering with the other. On the one hand, we have the person, who is manly in every respect, with normal sexual desire and power, with normal secondary sexual characteristics, yet whose semen contains absolutely no spermatozoa. On the other hand we have the invert, with no sexual inclination towards a female, but marked libido towards one of his own sex, with many marked feminine characteristics, yet when he marries, as he sometimes does for economic or other reasons, he is able to impregnate his wife and bring forth progeny.

It is with the former of these types that we have to deal. To advise an epididymo-vasostomy simply because no spermatozoa are found in the semen is absolutely unjustifiable. The condition may be either congenital or acquired. An attack of mumps, or a severe gonorrheal orchitis may produce the condition. How are we to diagnose this condition from azöospermia due to obstruction in the epididymi or vasa? It must be remembered that while the finding of a thickened condition of the epididymi is very suspicious of obstruction, it is not an infallible sign, for, not every thickened or nodular epididymis is obstructed. Furthermore, even if obstructed, it may not be the single cause of the azöospermia, for, in some cases of gonorrhea, not only is the epididymis attacked, but the inflammation is so severe that it takes in the testicle at the same time, completely destroying its spermatogenic function. Here again, epididymo-vasostomy or any other operation is doomed to failure. On the other hand I have called attention to a form of epididymitis or vasitis, in which there is not present the acute pain or swelling which accompanies the ordinary form of epididymitis, but in which there is just enough inflammation to cause an agglutination of the walls of the epididymis or vas. The patient never knows he had an epididymitis, there is not felt there-after the hard thickened nodule so characteristic of a previous epi-

didymitis, but the obstruction is there just the same, and in case both sides are affected, absolute azöospermia results.

I have devised a method of differentiating these forms of azöospermia. It consists in aspirating the testicle and immediately examining the aspirated testicular fluid for spermatozoa. I have described the technic in detail in some of my other publications^{32, 33, 36, 37} and will not repeat it here. I merely wish to mention that even in normal cases, the amount of fluid aspirated is very little, the number of spermatozoa found very small, and we may have to search for some time before finding any. Inasmuch as this is a paper on diagnosis and not on treatment of sterility, no detailed description of the treatment for these conditions is in order; I wish to remark, however, that in case spermatozoa are found in the aspirated fluid, our diagnosis is obstruction, and operation to relieve the obstruction is proper. In case no spermatozoa are found, no operation is indicated no matter how many nodules we find in the epididymis, but we may try to develop the spermatogenic function of the testicle by the administration of anterior pituitary lobe, which, at times brings about truly remarkable results.

Many pus cells in a condom specimen are distinctly abnormal, and if associated with absent, dead or feeble spermatozoa, we can, in a general way conclude that there exists some pathologic condition in the male sexual apparatus, which is responsible both for the pus cells and the abnormal semen, and which should be investigated. I have shown heretofore^{32, 36, 37} that pus itself does not interfere with the vitality of spermatozoa but that it is the pathologic condition in the genitalia which is responsible for the sterility as well as the pus. That this is not merely theoretical is clinically proved by the fact that a man can at the same coitus impregnate his wife and infect her with gonorrhea, the gonococci and pus not interfering with impregnation.

It cannot be too emphatically stated that the mere finding of a few active spermatozoa, or the finding of many feebly moving spermatozoa, does not absolve the male from sterility. Many inexperienced physicians do not see the importance of this. It is so easy to say to the patient that it takes only a single spermatozoon to cause impregnation, and as long as the specimen shows one live spermatozoon, impregnation is possible. When we consider, however, that with each normal ejaculation there are thrown into the female genitals more than three hundred million spermatozoa, in order that one shall reach the ovum, it is easy to calculate the chances of impregnation when only a few lively ones are ejaculated.

The finding of only dead spermatozoa in the semen is generally considered of no importance, whereas it has great diagnostic value. It tells us at once that there is no obstruction either in the epididymis

or vas, and that epididymo-vasostomy, the operation of anastomosing the epididymis and vas, is absolutely contraindicated in such a case. In these cases it must be determined by careful examination of the seminal vesicles, prostate and urethra, just where and what kills the spermatozoa. In such cases also one should make his own condom examination and not rely upon the report of a laboratory or other physician. One should also carefully inquire from the patient just how he collected and preserved the specimen, for at times, in spite of careful instruction, the patient may have slipped up in some detail, and caused the death of the spermatozoa after ejaculation.

Immature and deformed spermatozoa are occasionally found in a condom specimen. These are probably useless for purposes of impregnation, but do no harm and are occasionally found in perfectly normal semen. The main point in determining the fructifying power of semen is the finding of a large number of actively moving spermatozoa in every field. This is all we can expect to determine from the examination of a condom specimen. The viability of the spermatozoa in the various secretions of the female genitals, and their actual value for purposes of impregnation cannot be determined by any chemical or physical test of the specimen itself, nor can any conclusion be drawn from the behavior of spermatozoa from such a specimen under the microscope, but only by the "Huhner Test" presently to be described. I purposely desire to emphasize this point because there are some observers who have tried, and actually recommend the timing of the rapidity of motion of spermatozoa from a condom with the aid of a stop-watch, and base their valuation of the semen from such observations. Others have recommended the observance of how long spermatozoa will remain alive under the microscope. For many years I have protested against all these tests because they are not only not practical, but also because they are unreliable. What do we care how long spermatozoa live under the artificial conditions of the microscopic stage, as long as we can determine absolutely accurately how long they live, if at all, in the female genitals. Surely for practical purposes the latter deductions are of greater value than the former. Moreover, with the "Huhner Test" we test the vitality of the husband's semen in the genitalia of his own wife, which itself is of the most important practical diagnostic value.

Nor can we make any reliable deductions from how long spermatozoa remain alive under the microscope. Many times have I removed live active spermatozoa from the female cervix *several* days after coitus, only to see them die very rapidly under the microscope. Were we to make any deductions from their rapid death under the microscope, we would put them down as of very poor quality, whereas

the fact that they have lived several days in the female genitals. shows them to have been of very excellent quality.

Before describing the Huhner test, there is just one more point to which I desire to call attention. It often happens that single males, about to be married, are anxious to find out if they are sterile. This applies more particularly to those having had gonorrhea, and especially epididymitis. Of course we could advise them to indulge in coitus using a condom, and thus procure a condom specimen, but such advice ought not to be given. It has been my custom for many years, to have such patients call at my office with a full bladder, and as long as possible after a pollution. I then rather vigorously massage the prostate and strip the seminal vesicles until some of their secretions appear at the meatus, which I examine at once for spermatozoa. The amount of secretion appearing at the meatus varies greatly within perfectly normal limits. In some cases the fluid thus examined shows almost as many lively spermatozoa as a condom specimen, while in other cases very few are found. Both conditions are absolutely normal. The patient must be informed before such examination is made, that while the finding of live spermatozoa in a specimen obtained in this way, shows that the testicles are working properly and that there is no obstruction in the genital ducts, the absence of spermatozoa does not by any means indicate that the patient is sterile. In a condom specimen, as before said, it is imperative to find many active spermatozoa, but in a specimen obtained by expression from the prostate and seminal vesicles, their absence does not indicate anything pathologic. We simply cannot draw any conclusions. I have repeatedly found them absent in married men who were fathers of several children. Even if found, we must be careful not to make any statement guaranteeing offspring to the candidate for marriage. All we can say is that if the normal spermatozoon comes in contact with the normal ovum of the female, and no genital impediment exists in the female, impregnation will probably take place; but there is nothing in the appearance or action of the spermatozoa under the microscope which will tell you whether they will survive in the female genitals long enough to reach the ovum.

I have said that there are certain distinct limitations to the diagnostic inferences which can be drawn from the examination of either a condom specimen or one procured from manipulations of the prostate and seminal vesicles. The limitations have been gone into with much detail in other publications of mine^{22, 23, 24, 25, 26, 27} so that only the conclusions will be mentioned here. In the first place, we cannot in any case be sure that the spermatozoa will ever reach the cervix and fundus, or even the interior of the vagina. Take a case of hypospadias or epispadias; the condom specimen will be absolutely normal

yet, on account of the abnormal urethral opening, the fluid may be ejaculated entirely away from the cervix, or even outside of the vagina. As another example, we may mention a tight stricture of the urethra; here again, the condom specimen will be all that can be desired, but, on account of the stricture, the fluid is not at all ejaculated, but dribbles out of the meatus after the organ becomes flaccid. As another and very common condition, take the cases of partial impotence, with very rapid or even premature ejaculation. Here again, the condom specimen may be normal, but, on account of the weak ejaculation, the semen is deposited far away from the cervical os, at the very entrance of the vagina, or, in particularly bad cases, ejaculation takes place before penetration. Among other conditions showing a normal condom specimen, but in which the semen does not reach the cervix, may be mentioned abnormal positions of the cervix itself, awkward coitus, etc. Time will not permit me to mention every condition, so only the more common and obvious have been referred to.

Another serious limitation to the condom test is, that even if the spermatozoa get into the wife's genitals, there is no way of telling whether they will survive there. I cannot lay stress upon this point too emphatically, that, no matter how active or normal spermatozoa appear under the microscope, there is no way of telling from their appearance or action, that they will live in the various secretions of the female genitals. Moreover, a chemical examination of the female secretions, will also not give us any reliable data. Various experiments have been tried in both these directions, but little progress has been made. Besides all such tests are not only time-consuming, but require the services of an expert chemist, and are totally unfit for general use.

It was such limitations in our diagnostic ability with condom specimens that induced me, many years ago, to make a series of experiments and observations upon the behavior of spermatozoa within the female genitals. These observations extended over a period of six years, and culminated in a test for sterility which I called the "Spermatozoa Test," but which subsequent writers have called the "Huhner Test," and it will so be designated in this paper. The test is simplicity itself, and gives us such a fund of information regarding the diagnosis of sterility, and eliminating the disadvantages and limitations above referred to, that I make no apology for presenting it at some length. I hope the time has passed when the physician examined a drop of semen from a condom, and finding normal spermatozoa, immediately told the husband he was all right, and placed all the blame on the female.

All that is required for the test is any sort of pipette, and some

form of intrauterine syringe in case we desire to obtain specimens from the fundus.

The woman comes to the office as soon after coitus as possible, is placed in the ordinary gynecologic position, a bivalve speculum is inserted, the cervix is brought into view, and some of the cervical contents is sucked into the pipette, and immediately expelled on a slide and examined under the microscope. Often we at once see numerous lively spermatozoa, yet what a wealth of information is obtained from this few minutes' examination! What do we care whether the cervix is in its normal position or not, or whether we could reason out theoretically that, during coitus, the penis goes into this culdesae or that, whether the vagina is very short or of excessive width or depth—the *living spermatozoa on the cervix tell us at once, that for that particular penis, the cervix is in the right position to catch the semen.*

I do not wish to report cases, as it would unduly lengthen this paper. I cannot refrain, however, from citing a recent case, which is not at all uncommon. A woman who had been sterile, though married several years, came, by appointment for the Huhner test. The examination disclosed a large pool of semen in the posterior fornix, but the uterus was markedly retroverted, so that the cervix pointed directly upwards towards the abdomen, entirely away from the seminal pool. The entire fundus lay in the seminal pool instead of the cervix. Were we to reason from the gynecologic examination, we would certainly conclude that the sterility was due to the position of the cervix, which was away from the seminal pool. Yet the Huhner test showed the cervix simply swarming with live spermatozoa, showing conclusively that the position of the cervix had nothing to do with the sterility. In this case, the Rubin test subsequently showed both tubes occluded. In previous years, before it was so easy to determine the permeability of the tubes, and without the Huhner test, this woman would have been subjected to all sorts of operative procedure to correct a condition, which had nothing to do with the sterility.

Every year, I see many patients in my office who have been advised by their physicians to assume unusual positions during coitus with a view of aiding the spermatozoa to reach the cervix. This question is solved at once with my test. Again, we do not care if the woman tells us that she does not become pregnant because all the semen runs out of the vagina immediately after coitus, for we have positive proof before us (in case we find living spermatozoa in the cervix) that, no matter how much runs out, enough spermatozoa have reached the cervix for purposes of impregnation. What need we care, if informed that the husband suffers from rapid ejaculation, for again,

we have positive proof before us that he can deposit his semen in the right place. Similarly, we need not worry about many other conditions which are commonly supposed to be the cause of sterility, such as diminution or absence of orgasm in the woman, stricture of the urethra, epispadias, hypospadias and other conditions in the male, for we have found live spermatozoa in the cervix, and we therefore know that none of these conditions has any influence in this case of sterility.

Likewise we need not worry over the possibility of the cervical or vaginal secretions being inimical to the vitality of the spermatozoa, nor need we subject these secretions to chemical examinations, for again we know that they cannot be the cause of the sterility in this particular case. And so we may go through many of the theoretical ideas as to the etiology of sterility, and see how frequently they are dismissed as the result of this few minutes' examination. I may perhaps be pardoned for my enthusiasm concerning the test, but I really know of no other test from which so much valuable information can be gained in so short a time.

Suppose, however, that only dead spermatozoa are found in the cervix. We then examine a condom specimen, and if it contains only dead spermatozoa, we know the fault is with the husband; if live spermatozoa, however, are found in the condom, we know at once that something about the genital secretions of the female has killed the spermatozoa. Again we do not need to submit the secretions to time-consuming chemical and microscopic examinations to arrive at this conclusion, for we have the *physiologic* proof before us. In this condition, if we find the vaginal or cervical secretions markedly acid, we order a bicarbonate of soda douche before coitus, and make another test. If this second test now shows live spermatozoa in the cervix, we have not only made our diagnosis, but have been informed how to preserve their vitality and cure the sterility.

If no spermatozoa at all are found in the cervix, the husband may still be at fault, even though live spermatozoa are found in the condom. This is one of the most important practical features of the test. Ordinarily, a normal condom specimen was considered absolute proof that the husband was not responsible for the sterility. A gynecologic examination was then resorted to, and any slight deviation from the normal was at once seized upon as being the cause of the sterility, and the wife was subjected to prolonged treatment and even operation. Yet the husband may be suffering from urethral stricture, epispadias, impotence or any of the other conditions previously mentioned under the limitations of the condom test. In this case we request a condom specimen, and if it contains live spermatozoa in sufficient quantity, we must conclude that though the

semen is normal, he is unable to deposit them in the female genitals, and any of the previously mentioned pathologic causes which may induce this phenomenon is investigated. If, however, the condom does not contain any spermatozoa, the diagnosis is obvious, and our energy is directed towards finding the cause in the male as previously pointed out.

But the diagnostic value of the test is not limited to the cervix. We may look for spermatozoa as high up as the fundus uteri. At first blush this seems impractical, as, whatever specimens we obtain from the fundus are bound to be contaminated with those from the cervix. This objection, however, can be overcome by making the examination several days after coitus, at which time those spermatozoa which have been deposited in the vagina and cervix have already died. To make certain of this fact, we may, at the examination first take specimens from the cervix and vagina, and if these specimens show only dead spermatozoa, or none at all, and, with an intra-uterine syringe we can suck out live spermatozoa from the fundus, we can be certain that these could not have come from below. The minute details of this method of examination, have been published in some of my former works^{22, 23, 24} and will not be repeated here. Of course, the later after coitus such examinations are made, the more difficult it is to find spermatozoa. If we do not find any spermatozoa at all in the fundus, we cannot draw any conclusions, as they may not be found even in normal cases. The test therefore, as far as the fundus is concerned, is only of value if spermatozoa are found.

But if we find live spermatozoa in the fundus, what great diagnostic wealth is revealed to us! How many women have been subjected to prolonged treatment and operation because an antelexion was supposed to interfere mechanically with the ascent of the spermatozoa! How many women have been curetted because it was believed that the endometrium was inimical to the vitality of the spermatozoa! To the credit of the modern gynecologist be it said that these operations are not indulged in with anything like the frequency of former days, but the general practitioner has not yet learned this lesson. There is hardly a case of sterility which comes to me in which at least one dilatation and curettage has not been performed, and many of my patients had submitted to several of these procedures. The finding of live spermatozoa in the fundus at once shows the folly of such procedures in that particular case.

In these cases of sterility in which live spermatozoa are found in the fundus uteri, our diagnosis is narrowed down to one of three conditions: (1) a small, undeveloped or infantile uterus which will not nourish a developing impregnated ovum; (2) obstruction in the

tubes; and (3) condition of the ovaries, endocrine or otherwise in character.

The first can easily be diagnosed by vaginal examination. If we find a small undeveloped uterus, in a sterile woman and no other pathologic condition present, we may reasonably conclude that this is the cause of the sterility, and, in my experience, it is a very common cause. I must, however, warn at jumping at the opposite conclusion, namely, if on routine examination we find a small uterus to prophesy that the woman will be sterile. I have repeatedly examined women shortly after marriage for other complaints, and have found a very small uterus, and yet the woman conceived and gave birth to children.

Obstruction in the tubes can now be positively diagnosed by the Rubin test. The technic is very simple, entirely harmless, practically painless, and can be done in the office or dispensary, the patient going home shortly afterwards. The test should be made a routine just like the examination for spermatozoa.

The third condition, insufficient ovarian secretion as the cause of sterility, can be considered almost certain in those cases where we find an infantile uterus, together with late onset of menstruation, scanty menses, and menses coming on at very infrequent intervals, say only three or four times a year. To this syndrome is sometimes added lack of sexual desire, but, inasmuch as this latter symptom is very common in fertile women, it has little weight as a diagnostic phenomenon. Here we have a distinct endocrine disturbance, in which, in all probability, the other endocrine organs are also disturbed with the ovaries. Many of these cases are congenital in origin, or owe their onset to some disturbance prior to puberty. Endocrine treatment is distinctly in order, and I have had some remarkable results in this class of cases with corpus luteum extract.

Ovarian sterility may also be due to ovarian cysts, corpus luteum cysts, thickening of the tunica albuginea, thus preventing follicular rupture, etc. In these cases, the direct disturbance is also in many cases, endocrine in character, but the cause of the endocrine disturbance is found in local pathology. In some cases a pathologic condition in one ovary will cause endocrine disturbance in both ovaries. Many of these cases can only be diagnosed by exclusion, and some only by laparotomy.

Finally, in some cases there exists a disharmony between the spermatozoa of the male and the ova of the female. In these cases, both parties can produce offspring with different mates. Although some experiments have been made by testing the serum of the female against the spermatozoa of the male, no definite conclusions have thus far been arrived at, and no diagnostic aid has resulted from these experiments.

There are other forms of sterility which have not been touched on in this paper, because they are still in an experimental stage. Among such forms may be mentioned sterility due to a deficiency of certain chemicals in the blood, which is sometimes cured by putting the patient on a particular diet containing an excess of the deficient material. Sterility may be produced in animals by injecting male sperm into the blood of the female. By analogy this phenomenon is supposed to explain certain forms of human sterility, in which it is suggested that the sterility is due to the absorption of spermatozoa or their products by the female through her genitals.

I have thus shown that by a careful study of our sterile patients, we can, in the vast majority of cases, lay our hands directly on the offending organ or function in either sex. In conclusion I merely wish to mention one important caution in the diagnosis of sterility. In every case where a patient had submitted to a laparotomy, no matter for what condition, get in touch with the surgeon or hospital and find out the details if possible. It often happens that a gynecologist will, for perfectly justifiable reasons, remove both tubes, or one tube and the opposite ovary, without informing the patient what was done. At times the surgeon is afraid of a possible law suit, or he may think it too depressing for the patient to know that she is hopelessly sterile. In my experience, I have had not a few such patients consult me for sterility, whose histories showed that they had made the rounds of several general practitioners, even submitting to curettage or cervix operations for a sterility that was incurable, due to a previous operation. I remember one case which had submitted to various treatments for a period of ten years before seeing me, and upon investigation, I discovered that she had had both tubes removed for a tuberculous salpingitis. In some of these cases the Rubin test will show that the trouble lies beyond the uterus, but the exact diagnosis can only be obtained from the laparotomist.

BIBLIOGRAPHY

- (1) *Albfeld, F.*: Monatschr. f. Geburtsch. u. Gynäk., April, 1915. (2) *Bandler, S. W.*: Medical Gynecology, ed. 3, 1914. (3) *Idem*: New York Med. Jour. (4) *Barnett, C. H. J.*: Abstr. Urol. and Cutan. Rev., November, 1918. (5) *Bonifield, C.*: New York State Jour. Med., February, 1919. (6) *Bossi, L. M.*: Nouv. Arch. d. Obst. et Gynéc., 1891, vi, 161. (7) *Brandt*: Jour. Amer. Med. Assn., Feb. 10, 1923. (8) *Brun, A.*: Abstr., Jour. Am. Med. Assn., Feb. 21, 1920, 564. (9) *Burien, R.*: Ergebn. d. Physiol., Wiesb., 1906, vol. ii, Abt. 768-846. (10) *Cary*: Am. Jour. Obst., October, 1916. (11) *Child, Jr.*: AM. JOUR. OBSTR. AND GYNEC., December, 1920. (12) *Idem*: Sterility and Conception, D. Appleton & Co., N. Y., 1922. (13) *Cunéo, B.*: Abstr., Jour. Am. Med. Assn., Aug. 4, 1923, 424. (14) *Deluca, F. A., and Widakowich, V.*: Abstr., Jour. Am. Med. Assn., Nov. 1, 1919. (15) *Dickinson, Robert L.*: Amer. Jour. Obst., December, 1920. (16) *Dittler, Rudolf*: München. med. Wehnschr., Dec. 24, 1920. (17) *Döderlein, A.*: München. med. Wehnschr., May 14, 1912. (18) *Finger, E.*: Die Pathologie und Therapie der Sterilität beider Geschlechter, Leipzig, 1898. (19) *Flesch, Max*: Ztschr. f. Bekämpfung d. Geschlechtskrank., 1914, p. 139. (20) *Freidman, Joseph H.*: New York Med. Jour., May 4, 1921. (21) *Fürbringer, P.*: Real Encycl. d. ges. Heilk. (Eulenburg) ed. 2,

- Wien u. Leipzig, 1889, xix, 57-65. (22) *Idem*: Impotenz und krankhafte Samenverluste, Diagnostische und therapeutische Irrtümer und deren Verhütung, Leipzig, 1918. (23) *Gardner, A. K.*: The Causes and Curative Treatment of Sterility, with a Preliminary Statement of the Physiology of Generation. (24) *Giles, Arthur E.*: Sterility in Women, London, 1919. (25) *Idem*: Jour. Obst. and Gynec. of the British Empire, 1921. (26) *Grohe, F.*: Arch. f. Anat. u. Physiol., 1865, xxxii, Part 4. (27) *Haussmann, D.*: Ueber das Verhalten der Samenfäden in den Geschlechtsorganen des Weibes, Berlin, 1879. (28) *Hawkins, J. A.*: Jour. Am. Med. Assn., 1908, ii, 1424. (29) *Heineberg, Alfred*: Therap. Gaz., July 15, 1916. (30) *Hirokawa, Waichi*: Biochem. Ztschr., 1909, p. 291. (31) *Hochne, O., and Behne, K.*: Centralbl. f. Gynäk., Jan. 3, 1914. (32) *Hühner, Max*: Sterility in the Male and Female and Its Treatment, Reiman Co., N. Y. (33) *Idem*: Med. Rec., May 9, 1914. (34) *Idem*: Urol. and Cutan. Rev., November, 1914. (35) *Idem*: Reference Handbook of the Medical Sciences, 1917, vii. (36) *Idem*: Internat. Jour. Surg., March, 1921. (37) *Idem*: New York Med. Jour., May 4, 1921. (38) *Ishikawa, Yusaburo*: The Sei-I-Kwai Med. Jour., December, 1922. (39) *Ishiwara, F.*: Japan Med. World, March 20, 1920. (40) *Jacoby, Adolph*: Surg., Gynec. and Obst., April, 1923. (41) *Jones, H. Macnaughton*: Practitioner, London, July, 1915. (42) *Judd, Albert M.*: Med. Times, October, 1915. (43) *Kisch, E. Heinrich*: The Sexual Life of Woman. (44) *Idem*: Die Prophylaxe der Sterilität, München, 1900. (45) *Königstein, H.*: Wien. klin. Wchnschr., 1908, xxi, 971-973. (46) *Kohlbrugge, J. H. F.*: Arch. f. Entwicklgsmech. d. Organ., 1912, xxxv. (47) *Kosmak, Geo. H.*: Bull. Lying-in Hosp., June, 1913. (48) *Lespinasse, F. D.*: Ill. Med. Jour., June, 1916. (49) *Idem*: Jour. Am. Med. Assn., Feb. 3, 1917. (50) *Idem*: Urol. and Cutan. Rev. November, 1919. (51) *Lecha-Marzo, A.*: Abstr., Jour. Am. Med. Assn., Sept. 14, 1918. (52) *Lohnstein, H.*: Deutsch. med. Wchnschr., Dec. 27, 1900. (53) *Low, Otto*: Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Classe der kaiserlichen Akademie der Wissenschaften, June 5, 1900. (54) *McCown, P. E.*: Jour. Indiana Med. Assn., August, 1916. (55) *Natanson, Karl, and Königstein, Hans*: Wien. klin. Wchnschr., June 2, 1910. (56) *Nürnbergger*: Monatschr. f. Geburtsch. u. Gynäk., July 5, 1920, p. 87. (57) *Ochi, Shin-itsu*: Acta Scholae Medicinalis Univ. Imp. Kioto, 1916, i, No. 3. (58) *Percy, Samuel R.*: Am. Med. Times, March 9, 1861. (59) *Posner, C.*: Berl. klin. Wchnschr., 1907, xlv. (60) *Idem*: Ztschr. f. Urol., 1908, ii. (61) *Idem*: Archiv. f. Dermat. u. Syphilis, 1912, cxiii. (62) *Reynolds, Edward*: Am. Jour. Med. Sci., August, 1907. (63) *Idem*: Jour. Am. Med. Assn., Oct. 11, 1913. (64) *Reynolds, Edward, and Macomber, Donald*: New York State Jour. Med., December, 1920. (65) *Reynolds, Edward, and Macomber*: Boston Med. and Surg. Jour., March 23, 1923. (66) *Riddle, Oscar, and Behre, Elliner H.*: Am. Jour. Physiol., September, 1921. (67) *Rohleder, Hermann*: Die Prophylaxe der funktionellen Störungen des männlichen Geschlechtsapparates. (68) *Rongy, A. J.*: AM. JOUR. OBST. AND GYNEC., May, 1922. (69) *Idem*: New York Med. Jour., Oct. 18, 1922. (70) *Roth, A.*: Deutsch. med. Wchnschr., April 13, 1893. (71) *Rubin, I. C.*: Jour. Am. Med. Assn., April 10, 1920. (72) *Idem*: Jour. Am. Med. Assn., Sept. 4, 1920. (73) *Runge, Ernst*: Arch. f. Gynec., 1909, lxxvii. (74) *Sato, Shigeo*: Acta Scholae Medicinalis Univ. Imp. Kioto, 1916, i, No. 3, p. 361. (75) *Scheurer, P.*: Cor.-Bl. f. Schweizer Aerzte, Nov. 2, 1918. (76) *Shirlaw, J. T.*: Brit. Med. Jour., London, 1908, ii, 1671. (77) *Siegel, P. W.*: Deutsch. med. Wchnschr., Oct. 14, 1915. (78) *Sims, H. M.*: Tr. Am. Gynec. Sec., 1888, xiii. (79) *Solomons, Bethel*: Surg., Gynec. and Obst., February, 1920. (80) *Idem*: Med. Press and Circ., April 12, 1922. (81) *Stellwagen, T. C., and Pelouze, P. S.*: Jour. Am. Med. Assn., April 6, 1918. (82) *Stevens, N. M.*: Carnegie Inst., 1905. (83) *Strong, Lawrence W.*: New York State Jour. Med., August, 1919. (84) *Sturmdorf, Arnold*: Am. Jour. Obst., 1917, lxxvi, No. 3. (85) *Utzmann, R.*: The Neuroses of the Genitourinary System in the Male. (86) *Faughan, Victor C.*: Jour. Lab. and Clin. Med., December, 1916. (87) *Vogt, E.*: Klin. Wchnschr., June 3, 1922. (88) *Waldstein, Edmund, and Eklér, Rudolf*: Wien. klin. Wchnschr., Oct. 16, 1913. (89) *Walker, Kenneth M.*: Lancet, London, July 30, 1921. (90) *Widakowich, F.*: Abstr., Jour. Am. Med. Assn., Feb. 5, 1921, p. 412. (91) *Idem*: Abstr., Jour. Am. Med. Assn., June 3, 1922. (92) *Zelenec, Prof.*: Trans. Am. Jour. Urol., August, 1914.

THE INTRAUTERINE CONTRACEPTIVE PESSARY— INEFFICIENT AND DANGEROUS

By R. S. SIDDALL, M.D., DETROIT, MICHIGAN

(From the Obstetrical Department of the Henry Ford Hospital.)

NOTWITHSTANDING all attempts to suppress the birth control movement, the fact remains that considerable information and misinformation regarding contraceptive means have been disseminated among the public. On the other hand, it is well known that most members of the medical profession recognize certain disease conditions as contraindications to pregnancy and their presence as sufficient justification for the recommendation of contraceptive procedures. Various devices have been developed for both professional and illegitimate use, but, although many are inefficient and others are harmful, there is very little specific information in the American literature on the subject, a situation which no doubt has led to the widespread adoption of uncertain or harmful methods. However, the matter has been studied and presented in the foreign literature, especially in Great Britain and Germany, and the facts seem to be established in regard to at least one contrivance, namely the intrauterine contraceptive pessary.

It is stated by Pust that in Germany the various models of this type of pessary are among the most commonly employed means for preventing pregnancy. In this country it is not uncommon to see them and to be called upon to treat illness which has resulted from their use. It is interesting to note that this is the method which one of the leading proponents of birth control in this country is said to recommend as being both certain and harmless. It would seem, however, that she is mistaken in both respects, and it is regrettable that so many have been influenced without further investigation to use this pessary. The following case report is illustrative of the inefficiency of the method:

H. F. H., 26966, white, aged twenty-seven, married in 1917. The patient was first seen at this Hospital on March 20, 1923, and the essentials of the remote history taken at that time were as follows: She had never been ill except for the usual exanthemata of childhood. Since the age of twelve she had noticed a swelling in the region of the thyroid gland which had since increased gradually in size, especially with pregnancy. Upon direct questioning no history of symptoms referable to hyperthyroidism was obtained. In 1919 and again in 1921 she had been delivered by spontaneous labor of normal children, and in March, 1922, there was a spontaneous abortion of an early conceptus.

Soon after the abortion in March, 1922, the intrauterine contraceptive pessary (described below) was introduced by a physician. In September, 1922, she stated that, when about two weeks past the expected time of menstrual period, there had been severe bleeding for ten days with temperature up to 104° and the expulsion of several small blood-clots,—no doubt an early abortion. The next and last menstrual period occurred on November 24, 1922. Soon afterwards nausea and vomiting developed and the patient believed she was pregnant. For several months she had noticed more than the usual dyspnea upon exertion.

Examination on March 20, 1923, confirmed the history as to the existence of pregnancy, the size of the uterus corresponding to the menstrual history. The disc of the pessary was held tightly against the tip of the cervix by tissue which had grown down through the ring, and considerable difficulty was experienced in its removal. Following this there was a thick mucous discharge and slight bleeding but no serious results. On general physical examination a well compensated mitral stenosis and insufficiency was noted. There was also rather marked diffuse enlargement of the thyroid gland but no definite signs of hyperthyroidism. The blood Wassermann was negative with plain, cholesterinized, and Kolmer antigens.

The pregnancy progressed uneventfully, the blood pressure never going above 120, the urine never showing albumin, sugar, or casts, and the heart condition remaining satisfactory. On September 17, 1923, sixteen days past the calculated expected date of confinement and after the administration of castor oil and quinine sulphate, the patient had an easy spontaneous labor with the birth of a normal child. The puerperium was uneventful, and at the end of two weeks both mother and child were discharged from the hospital in excellent condition. On microscopic examination the placenta showed nothing abnormal except white infarcts, and the umbilical cord was normal.

Description of the Pessary.—This pessary is apparently made entirely of gold which is labeled "14 K," and weighs three grams. The part which fits over the tip of the cervix is 2.5 cm. in diameter and concave on the surface next to the cervix. In the middle there is a hole 1 cm. in diameter, and across this a narrow bridge of metal which supports two upright wires 5 cm. long. These are encased in a small wire coil for a distance of 2 cm. from the button, and it is this part which occupies the cervical canal. Above the coil the two upright wires extend for 3 cm. and are widely separated, each ending in a pear-shaped head. These parts by their spring effect pressed against the lateral uterine walls and served to retain the contrivance in place. Obviously the pessary could not be expected to protect the cervix mechanically from the entrance of spermatozoa since the external os was exposed through the hole in the cervical cap.

The various modifications of this intrauterine pessary were discussed at length at the Dresden Gynecological Society meeting in May, 1921, and its uncertainty and ineffectiveness were evidently common knowledge among those present. Rübsamen stated that a few days previously he had removed such a pessary from a woman then in the second month of pregnancy, and Richter mentioned several similar experiences. Royston (1923) reports the delivery of a woman at term following the removal of a pessary when she was three months pregnant. Mellroy of London believes that the device favors rather than prevents pregnancy.

As can well be understood, the introduction of such an instrument into a uterine cavity in which a pregnancy already exists would very

probably lead to abortion. Kehrer stated that he had repeatedly seen this as an accidental or intentional result.

Probably the most important argument against the use of these pessaries is that they are irritating to the endometrium just as are other intrauterine pessaries or foreign bodies. Kehrer says that they set up inflammatory reaction after remaining in for as short a time as one week. He and Prüsman, and West in this country, have seen severe endometritis, salpingitis, parametritis, and pelvic peritonitis as a direct result of these irritating foreign bodies, and Abbott-Anderson reports that death has occurred in several instances. Albert, Richter



Fig. 1.—X-ray of pelvic region before removal of contraceptive pessary.

and Barrett state in no uncertain terms that there is grave danger in their use. On the other hand, Pust thinks that the intrauterine part of his contrivance, which is made of silkworm gut partly wound with silk, is not irritating. However, Kehrer states that he has seen severe endometritis from silkworm gut sutures, and Haire believes this type to be open to the same objections as the other forms. Indeed, it is believed that none of these devices do much towards preventing conception, but rather do they promote early abortion by reason of the endometritis which their presence has induced. Such, perhaps, is

the explanation for the early abortion in the case outlined above. Certainly, the temperature elevation indicates that severe infection was present.

BIBLIOGRAPHY

- (1) *Richter, Albert, Präsmann, Rübsamen, Kehrner*: Gynäk. Gesell. z. Dresden, May, 1921; Zentralbl. f. Gynäk., 1921, xlv, 1455. (2) *Pust*: Deutsch. med. Wehnschr., 1923, xlix, 952. (3) *Abbot-Anderson, Barrett, McIlroy, Fairbairn, Whitehouse, Fothergill, Haire*: The Practitioner, 1923, cxi, 6-90. (4) *West*: AM. JOUR. OBST. AND GYNEC., 1923, v, 383. (5) *Royston*: AM. JOUR. OBST. AND GYNEC., 1923, v, 425.

GYNECOLOGIC PLASTIC SURGERY UNDER SACRAL-TRANSSACRAL ANESTHESIA*

By M. O. MAGID, M.D., AND WILLIAM KLEIN, M.D., NEW YORK, N. Y.

WHILE plastic gynecologic surgery may not be classed as emergency surgery and may be omitted, if organic lesions exist in the patient that preclude the use of a general anesthetic, there are many cases where a plastic gynecologic operation would relieve a patient of constitutional symptoms, as with a focus of infection in the cervix, and from discomforts due to an extrusion of the bladder or rectum or both, and finally with various degrees of prolapse of the uterus caused by a loss of support of the pelvic floor.

Plastic surgery in gynecology may therefore be included as a necessary practice for relief. In order that we should be able to operate on those cases in which a general anesthetic might be a source of danger, different types of regional anesthesia are being practiced, with the idea of perfecting such a method under which these operations may be made as nearly painless as they would be under a general anesthetic.

The object of this paper is to present a report of a series of cases operated on at the Bronx Hospital under sacral-transsacral anesthesia, with the hope of encouraging other surgeons to use this method, that their patients may be spared the discomforts and possible added shock of a general anesthetic.

There are certain advantages of sacral-transsacral anesthesia, which is an improved method of all other forms of nerve block, over general anesthesia, in that there is a lowered immediate and remote risk to operation. The possibility of lung complications is eliminated. Nausea, vomiting and thirst are absent. Instead the patients are comfortable in every way and may be fed a fairly good meal, several hours after the operation. Another advantage is that liquids may be given to the patients during the course of the operation.

*Read before New York Physicians Association, November 28, 1923.

While both local anesthesia with scopolamine and spinal anesthesia methods as well as nerve block have been used in cases of so-called "bad risks," the time has come when, with perfected technic, we use spinal anesthesia and its modifications, in cases that are "good risks," i.e., patients who are physically able to stand a general anesthetic, but dread the idea of being rendered unconscious and prefer block anesthesia. These patients are easily controlled by morphine and scopolamine, in such doses that will obtund their sensibilities to a degree that they are unconscious of their surroundings and yet are able to respond to questions.

In our series of cases we have twelve patients on whom tracheloplastic operation was performed, also operations for rectocele and

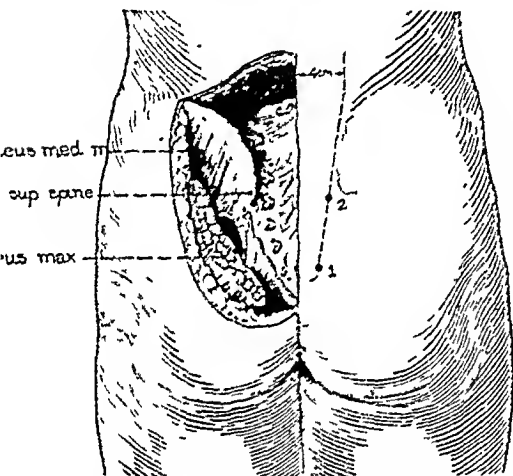


Fig. 1.—Transsacral block. The superficial landmarks in relation to the posterior sacral foramina. (Labat.)

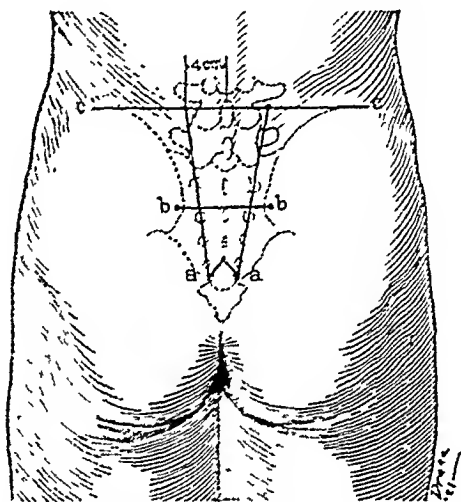


Fig. 2.—Transsacral block. Tracing of the lateral rows of sacral foramina on skin surface; *a, a*, are the sacral cornua; *b, b*, the posterior superior iliac spine; *c, c*, line tangent to the highest points of the iliac crests. (Labat.)

cystocele; two were operated for rectocele and cystocele, and one for reetovaginal fistula. The ages varied from twenty-seven to sixty-eight years.

The technic of the operation on the cervix and perineum was that described by Sturmdorf. The outstanding features of these procedures are that the dissection on the cervix is deeper and more extensive than that of the Emmet, Sims, or Schroeder operations. In the latter, the denudations are superficial. They do not require as much traction on the uterus as is necessitated by the tracheloplastic operation, especially when the sutures are inserted. It is at this point that the patients experienced a little discomfort. They did not complain of pain but were conscious of a dragging down sensation, which lasted only a few minutes, caused by traction on the uterus while the Peaslee needle was forced through the uterine tissue just above the

internal os. At one more step of the operation, the patients moaned. This was when the cervical denudation reached the euldesae. When the finger was inserted between the denuded cuff and the uterine and traction was made on the posterior flap, some discomfort was experienced. The complaint was not of pain but of a dragging sensation.

The levator myorrhaphy in every case was entirely without any complaint. In each case the vaginal mucous membrane was denuded until the levator ani muscles were exposed. These were sutured together with catgut. The mobilization of the levator muscles necessitates deep dissection. This was accomplished without any pain or discomfort.

In this series we used the combined method instead of either the sacral or transsacral method, either of which might have sufficed in a limited number of cases for the following reasons: With the combined method the anesthesia is of longer duration; in not a few sub-

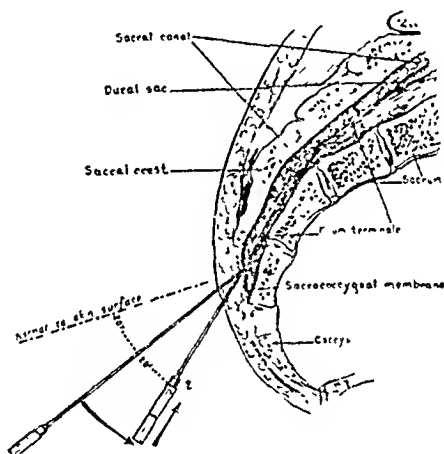


Fig. 3.—Sacral block. After piercing the sacrospinous membrane the needle impinges on the anterior wall of the sacral canal and passes from position 1 to position 2 in the direction of the arrows. (Labat.)

jects the posterior segments of the sacrum fail to close, in which cases the anesthetic is deposited in the ligament and a complete anesthesia is not obtained when the sacral block alone is employed. Again, with a transsacral block alone, it has been found that the sacro-coccygeal plexus is at times not well anesthetized.

The anatomy of the sacrum and of the coccyx has been omitted for obvious reasons, but a few important points are pertinent for the sake of clearness. The upper part of the sacrum is at a considerable distance from the overlying skin. This varies from 4 to 8 cm. and decreases as we descend. The first sacral foramen proper has a depth of about 2 cm., the rest of the foramina decrease by a half cm. The last or fifth nerve emerges just beneath the sacrospinous membrane.

A Labat syringe was employed, but any good Record syringe with well-fitting needles of the desired length will do. The solution used

was 1 per cent. novocaine-adrenaline. Forty-five minutes before the operation, a hypodermic injection of morphine sulphate gr. $\frac{1}{4}$ and scopolamine gr. $\frac{1}{200}$ was administered.

The technic of the anesthesia as carried out by Dr. Wm. Klein of the Surgical Division of the Bronx Hospital is as follows:

The patient is placed flat on the abdomen with a cushion under the hips, thereby bringing the landmarks into prominence, also making them more accessible. The sacral hiatus is then defined by passing the tip of the left index finger from the end of the coccyx upwards along its prominence until just above the gluteal fold at which point a depression is felt. This marks the junction of the sacrum and coccyx. A ridge can be felt on either side of this depression; this being the cornu or lateral margin of the sacral hiatus. An intradermal wheal is made here. A needle 10 cm. long, preferably one with a bevelled stilet in it, with its bevelled edge turned upward, is introduced through the wheal at an angle of about 20 degrees. It is gently pushed forward until the sacrococcygeal membrane is pierced. We are then in the sacral hiatus. The needle is advanced until it comes in contact with the bone. It is then withdrawn about 1 or 2 mm. and the hub of the needle is bent downward towards the gluteal fold at an angle of about 40 degrees or more when necessary. The needle is then advanced into the sacral canal keeping in the midline until about 6 cm. have disappeared. It is a good plan to keep the tip of the left index finger at the point where the needle entered as it helps to steady the needle and to depress its proximal end when necessary. The stilet is then withdrawn and the hub of the needle is watched for spinal fluid or blood. If either is found to escape, the needle is withdrawn a little until the flow ceases. After all the air bubbles have been expressed, the syringe is attached to the needle, and the piston withdrawn a little to ascertain beyond all doubt that the injection is not made intravenously or into the intradural space. All details having been observed, 30 c.c. of the solution is then injected very *slowly* until most of the fluid is deposited. The rest of the fluid is slowly distributed while the needle is being withdrawn; the last few drops are deposited just beneath the sacrococcygeal membrane. A piece of sterile gauze is placed over this area. This completes the epidural injection, or sacral block.

For the transsacral block the patient is retained in the same position. The posterior superior spine of the ilium is located by passing the finger along the crest of the bone. In very fat subjects it can often be seen as a dimple or depression. A point about 1 cm. below and internal to it, indicates the second sacral foramen. This is marked with an iodine applicator. The sacral cornu on the same side is defined as previously described, and a similar mark is made indicating the fifth sacral foramen. A line is then drawn between these two points and an intradermal wheal is raised at either end. Two similar wheals are raised on this line at equal distances from both ends and from each other, dividing the line into three equal parts thus marking the third and fourth sacral foramina. At a point about 2.5 cm. above the upper end of this line and in the same general direction, i. e., upwards and slightly outwards marks the first sacral foramen, where a wheal is raised.

A needle about 10 cm. long is introduced perpendicularly to the skin and slowly advanced to a depth of from 4 to 8 cm. This will vary with the amount of adipose tissue encountered. When the needle makes contact with the posterior surface of the sacrum, it is moved about slowly until it is felt to sink to a deeper level. We are then in the sacral foramen. Here the needle is advanced not more than 2 cm. in the first sacral foramen. The same observations relative to

the possible flow of blood, as previously described, are made. If no blood escapes from the needle, the syringe is attached and withdrawn a little to ascertain its position as regards a blood vessel. Six c.c. of the solution is then injected. The same needle can be used for the second foramen, keeping in mind that there the needle must not be advanced to the same depth as the sacrum here is much more convex and therefore nearer to the skin. Here inject 5 c.c. of the solution. For the third foramen a needle half the length is sufficient and only 4 c.c. of the solution is injected. The fourth sacral foramen is again nearer to the surface than the third and the canal is only about 1 cm. long. Here 2 c.c. are injected. Finally, the fifth foramen is injected just beneath the sacrococcygeal membrane, 2 c.c. being deposited here. The same procedure is followed on the other side.

The anesthesia sets in immediately. The duration of the operation in the complete plastic cases averaged one and one-half hours, the tracheloplastic operation averaged about half an hour. The anesthesia continued for about an hour in some cases and a little longer in other cases, after the patients had been made comfortable in bed.

While it is not fair to assume that sacral-transsacral anesthesia is entirely comfortable to the patient, we believe that the slight discomfort which the patient might experience is well compensated by the knowledge that they have been relieved of maladies that have invalidated them for a number of years.

It is hoped that by perfecting the technique, which only comes after much practice and observation, even these slight discomforts will be eliminated.

EXPERIMENTAL ATTEMPTS TO PROMOTE UTERINE GROWTH*

BY M. R. ROBINSON, M.D., F.A.C.S., NEW YORK, AND DR. B. ZONDEK,
PRIVATDOZENT IN THE UNIVERSITY OF BERLIN

FOR centuries preceding Brown Sequard's experiment, of injecting himself with testicular extract, in order to regain his lost vigor, physicians have employed glandular substances of animals as remedies for lost or weakened function of the corresponding organs, in the human. The clinicians of old, groped instinctively and intuitively through the devious trails of endocrinology; and we, with all the scientific means at our command, are still struggling to link theory to practice, with but slow, hesitating and faltering steps. We have learned to diagnose endocrinopathies with a fair measure of accuracy, but we have as yet not attained the same degree of efficiency in combating these disorders. The prevailing opinion, why our therapeutic successes with the endocrine preparations are not commensurate with the claims made for them by the manufacturers, is, that

*From the Universitäts-Frauenklinik der Charité-Berlin. (Director: Geh. Med. Rat., Prof. Dr. K. Franz.)

This joint research was started during the winter of 1921 in the Universitäts-Frauenklinik of the Charité in Berlin and subsequently completed by Dr. Zondek.

these preparations either contain no "specific content" at all, or only part of the "active principle" of the particular gland in question. The past two decades have witnessed an intense activity on the part of biochemists and physiologists to isolate the active principles of the ductless glands, with astonishingly varied and contradictory results. Thyroxin, adrenalin, and pituitrin stand out at present as the triumphs of endocrine pharmacology, but recent information tends to weaken the solidity of even these few keystones in the foundation of organotherapy.

Hunt¹ claims "that for certain functions at least, thyroxin shows less potency than an equivalent dose of iodine in the form of the entire gland. So that thyroglobulin isolated from the glandular portion of the thyroid is not the active principle, but only one of the active principles of the thyroid."

Epinephrin, prepared from the medullary portion of the adrenal, is now claimed by Hartman² to be produced in the cortex of the gland, and that the medulla only serves as a receptacle for the secretion.

In the realm of gonadal therapy the confusion is still worse as will appear from the following survey of the recorded investigations.

A RETROSPECT OF OVOTHERAPY

The first clinical success with ovarian extract in a young person who suffered severely from the molimina of a surgically induced menopause was reported by Mainzer³ of the Landau clinic, in 1896. As further trials with this preparation failed to give as brilliant results as originally recorded, investigations were set on foot to find and isolate the active principle or principles of the ovary.

Fraenkel's⁴ researches led him to state that the corpus luteum is the important structure in the ovary which promotes uterine hyperplasia and causes it to undergo the cyclical histologic changes requisite for the nidation of the fertilized ovum.

Among American gynecologists, Burnam⁵ was the first to report encouraging results from the use of fresh corpus luteum.

Loeb's⁶ production of decíduomata, and Bouin and Ancel's⁷ substantiation of Fraenkel's claim, that the corpus luteum is capable of producing hyperemia, congestion, and hyperplasia of uterine mucosa, seem to have furnished the conclusive proof, that this organ does promote uterine growth.

Following closely upon the above cited reports, Franks⁸ published the result of his investigations in which he stated, that he failed to sensitize the uterine mucosa, or to bring about the decíduomata of Loeb, or the normal hyperplasia of the uterine mucosa, usually noted after follicular rupture, with subcutaneous or internal administrations of corpus luteum.

Adler⁹ used watery extracts of the ovary and produced estrual changes in virgin guinea pigs and rabbits,—with corpus luteum extract, the hyperplastic phenomena were less noted. Schieckele¹⁰ experimented with castrated animals, and used watery and alcoholic extracts both from the ovary and from the corpus luteum, and could find no difference in the degree of edema, hyperemia and secretion of the genitalia produced by either of the extracts.

Iscoveseo¹¹ has attempted to isolate the active principle of the corpus luteum by means of solvents which would retain the lipid content. It was his conviction, that the vital ovarian hormone is bound up with the fatty constituent of the corpus luteum. He has also isolated a similar lipid from the ovary, and found that both these extracts possessed similar physiologic and therapeutic properties.

Fellner¹² repeating the experiments of Iscoveseo arrived at the same conclusion.

As the preceding experiments lacked chemical definiteness, Herrmann¹³ set out to isolate an ovarian hormone that would fulfill these requirements. The result of his efforts was the production of a pentamine phosphate (N_5P_2), with which he could cause an enlargement and an hyperemia of the uterine horns in animals. Two years later he described this "active principle" of the ovary as a yellow, viscid easily volatile oil, which solidifies on cooling and gives a positive cholesterol reaction. He has also isolated a similarly potent principle from the placenta, which rendered equally good experimental successes.

Aschner¹⁴ injected virgin guinea pigs with watery extracts of ovarian and of placental tissue, and has often obtained a marked growth of the uterine horns and vagina. The uterine horns reached the thickness of a finger, contained blood (hematometra) and the ovaries also showed evidences of stimulation. Corpus luteum extracts failed to give the same results.

Seitz, Wintz and Fingerhut¹⁵ have isolated from the corpus luteum two lipoids: (a) luteolipoid (from old corpus luteum) which inhibits uterine bleeding and is indicated in cases of ovarian hyperfunction, and (b) lipamin (from fresh corpus luteum) which stimulates the uterus to hyperplasia, and is therefore recommended in functional disturbances due to ovarian hypofunction. Both these extracts are not soluble in alcohol, but are soluble in acetone and in ether, and are free from cholesterol.

Frank¹⁶ in retracing the steps of preceding investigators came to the conclusion that the aqueous extracts contain little of the active principle, while the lipoids derived through alcoholic, ethereal, or acetone extraction, are most potent. And like Herrmann, he has found that the placental extracts obtained through similar methods yielded physiologic results, equal to those of the ovary. The most important fact in Frank's contribution is, "that the extract containing all of the fat soluble substances is by far the most potent." This fact has a vital bearing upon the pharmacology of organic extracts, and furnishes the axiom, that, just as endocrinopathies are due to pluriglandular disturbances, so is the active principle of the ductless gland not contained in any singular portion of the gland, but in the gland as a whole.

Matsumata and Macht¹⁷ have further upset our recently gained knowledge about the physiologic effects of the ovarian and the corpus luteum extracts upon the isolated uterus. They were able to call forth contractions in the uterus with extracts derived from other glands and organs, and thus denied the specificity of the gonadal extracts.

Kohler¹⁸ in 1915, and Esch¹⁹ five years later, raised the question as to whether the hypodermic administrations of ovarian and of corpus luteum extracts constituted a specific therapy or a nonspecific protein treatment. Esch succeeded in getting as good, if not a better result, with subcutaneous injections of aolan and caseosan, as with extracts from the genital glands particularly in cases of metrorrhagia.

Wintz²⁰ recognizing the fact, that the various extracts and pressed juices derived from the endocrines do not represent the internal secretions in their true physiologic state, for decomposition and uncontrollable chemical changes take place in their preparation, conceived the idea of utilizing the liquor folliculi in its unaltered state, for therapeutic purposes. The results were far beyond his expectations. Fresh follicle juice and old follicle juice gave different reactions. The former had no effect

upon blood pressure, coagulation time, or upon the acceleration or diminution of the menstrual function. The latter on the other hand caused a rise of the blood pressure and hastened coagulation but had no local effects upon the genitalia. Wintz ascribes the potency of the old liquor folliculi to the formation therein of albuminoid split products.

Frank²¹ continuing the experiments of Wintz, reported favorable results in causing hyperemia and enlargement of the genitalia in rabbits. Frank²², refuting a misquotation by Allen and Doisy²³ states that "the ovarian hormone is no longer hypothetical and is not limited to the follicle fluid. It is contained in the follicle fluid and in the corpus luteum, probably also in the placenta."

This review of the literature for the past twenty-seven years proves how uncertain we still are about the vital hormone of the ovary. If watery extracts, alcoholic, ethereal and acetone solutions, cholesterin-free and cholesterin-containing substances, derived from the ovary, from the corpus luteum, and from the placenta, preparations so different in their anatomical derivation and in the method of production, are all capable of calling forth almost similar physiologic results, how can we claim specificity for any one of them? The hormone theory is no longer an hypothesis, each ductless gland possesses a secretion peculiar unto itself, but the glandular preparations in the form of extracts and solutions as obtained in the market surely do not represent their physiologically active principle. Are there any preparations which do contain a true hormone, and if so which are they, and how may they be best produced? We shall attempt to answer this question.

PERSONAL EXPERIMENTS

That the growth of the uterus is dependent upon ovarian function is no longer doubted. Physiologically the uterus attains its normal size at puberty, which is denoted by the appearance of menstruation: it maintains these dimensions, with some slight increase during adolescence and maturity; at the beginning of senescence, involution and finally atrophy of the genital tract take place, due to a sudden or to a gradual cessation of ovarian activity. Clinically we meet with the infantile uteri, acute antelexions, dysmenorrhea, oligomenorrhea and sterility, when the ovary fails to function fully during the formative period of life; or we witness the psychic vasomotor disturbance of an artificially produced menopause, following operative removal of the genital glands. The hyperfunction of the ovary finds expression early in life in the phenomenon of pubertas precocx, and later on in excessive periodic or irregular uterine bleeding. Every means therefore which will enable us to control and regulate ovarian function particularly in the direction of stimulating genital growth, will constitute a most valuable addition to the gynecologist's armamentarium.

In practice we are employing dry preparations, but chiefly extracts of the ovary. The experimental investigations which one of us,

(Zondek,²¹) has carried out upon the isolated heart, the uterus, and the small intestine, as well as upon the blood and upon metabolism, have shown that a *specific substitution therapy can only be accomplished* with either gland transplantation, or with a chemically pure endocrine derivative, but not with the broken up dry preparations. If the endocrine glands are subjected to a chemically schematic splitting up process, then we obtain extracts in which the active principle has been destroyed. Against these views are undoubtedly those manifold experiments which claim a specificity for the ovarian extracts. It thus became necessary to answer the following questions: (1) Is it possible to stimulate the growth of the genitals in virgin animals with the ovarian extracts? (2) Can this be accomplished with these extracts only, and how do the extracts of these glands act? (3) How do the nonspecific albuminous bodies and the albumin end products act?

Our experiments were carried out upon virgin guinea pigs, which at the beginning were of an average weight of 200 grams. It appeared to us, that in order to exclude the possible sources of error which limited experimentation most frequently entails, we ought to extend our investigations over a large series of animals. We also learned, as will be stated later on, from our control examinations, that the appearance of the genitalia, the state of their vascular distention, the succulence and the thickening of the uterine mucosa, are all dependent upon seasonal variations. All the animals were killed with chloroform, so as to further insure experimental uniformity. As to the estimation of the variations in the size of the organs, relative to our experiments, we became convinced that ocular inspection alone is misleading, even when the hypertrophy is very pronounced, and we have hence substituted a far more dependable guide, the torsion scale. All uteri were amputated at a level two mm. below the fusion point of the uterine horns, and after a close separation from the parametric tissues, they were excised together with the ovaries. The method is very simple, and the weight can be established with absolute accuracy. In order to form an idea about the state of other ductless glands, the spleen and the adrenals were also weighed and the kidneys examined.

According to our viewpoint the only dependable objective method by which the difficult problem of organic hyperplasia and growth can be proved without contradiction is by analytical weighing. Mere inspection, as already mentioned, is too uncertain a method for comparative studies, particularly if the examinations are made at long intervals of time, when the recollection of the previously seen uteri is already hazy. The microscopic findings, such as the thickness of the muscle and the mucosa, may also be misleading, unless the sections from the horns are taken at precisely the same level in all the specimens; a fact which can never be realized with absolute exactness. And

even if this were possible, the thickness of the uterine wall at the same level in a different animal of the same species is subject to wide variations.

The weight determination of the uterus and the ovaries proved to be quite constant. The relation of the body weight to that of the enumerated genital organs was as 1:1200, i.e., the uterus and the ovaries weighed in milligrams somewhat less than the gram weight of the animal.

A few examples may elucidate:

Weight of guinea pig	:	Weight of uterus and ovaries
290 gm.	:	224 mg.
300 gm.	:	238 mg.
240 gm.	:	212 mg.
250 gm.	:	212 mg.

These investigations were conducted during all the four seasons of the year and it was found that genital growth, even in the virginal apparently still sexually unripe animals, is influenced by seasonal variations. This was particularly noted during the months of June and July, when the genitalia evinced hyperemia, succulency, and an increase in the thickness of the uterine wall. During these months the weight relationship of 1:1200 was no longer retained, because the uterus and the ovaries gained in weight. The latter weighed in mg. more than the corresponding gm. weight of the animal, the proportion has changed to about 1:900, as shown by the following figures:

Animal	Month	Weight	Weight of uterus and ovaries
No. 7	6-16-22	280 gm.	300 mg.
No. 8	7-17-22	280 gm.	464 mg.
No. 82	7-22-22	350 gm.	368 mg.

A second stimulating period is found at the beginning of the winter, during the month of November. At this time we have found the following proportions:

Animal	Weight	Weight of uterus and ovaries
No. 88	220 gm.	290 mg.
No. 21	210 gm.	230 mg.

The microscopic examinations of the ovaries showed that corpora lutea may form also in virgin guinea pigs. These animals were of an average age of six months. Very striking was the fact that the ovary presented a different appearance at different seasons. During the winter months the ovaries contained many cystic follicles, while during the summer the stroma was more compact. But there were many exceptions, so that we must be careful in the interpretation of these findings. If we should lay too much stress upon the conditions

just described then we may easily arrive at erroneous conclusions. For example, if the experiments are begun in April or in May and the injections of the trial preparation are continued up to June, most of the sectioned animals will show an hyperemia and an hyperplasia of the uteri. The logical conclusion would be that the preparation experimented with, has exercised a specific influence upon uterine growth; while in reality, the climatic condition constituted the active agent.

After having found an objective method in the weight estimation of the genitalia, and in the relation of their weight to that of the body, we have set for ourselves this problem: Is ovarian extract capable of stimulating uterine growth?

As Zondek has shown in his earlier investigations that the biologic reaction to organic extracts depends upon the nature of their production, particularly upon the method in which their albumin constituents are separated, we have undertaken to test the efficiency of different ovarian extracts. For this purpose the ovaglandols and the ovarian optons were selected. The former are chemically de-albuminized substances, prepared by the Grenzach laboratories; the latter are according to Abderhalden, produced by means of tryptic fermentation. Animal No. 81 received 15 c.c. of ovaglandol, on July 28, 1922, and besides a slight congestion of the uterine horns, showed no evidences of hyperplasia, the weight relationship stood 280 gm. : 280 mg. Animal No. 11, experimented upon in the winter, did show a marked reaction; the weight proportions were 210 gm. : 315 mg. These tests showed the inconstancy of this preparation, and that we possess no means, as was shown in previous experiments, of guaranteeing their uniformity of action. The results with the tryptically prepared ovarian optons, were altogether *nil*, the weight proportion was 280 gm. : 218 mg. The conclusion is, *that only with chemically prepared ovarian extracts, and not with those obtained through tryptic fermentation, may results be obtained from time to time.* The results which Asehner obtained with ovarian extract we could not verify. Even with the most active preparations, which will be considered later on, we could never get such intense reaction, as Asehner described and sketched. We are inclined to believe that some unknown source of error has crept into Asehner's experiments. No results were gotten with corpus luteum or with placental extract. As placental extract, we have used the placenta opton (hydrolytic preparation), with which Puppel²⁵ reported hyperplastic results. Puppel's investigation will be subjected to a critical analysis further on.

How do other organic extracts act? The tests with a chemically prepared testicular extract (testiglandol) showed a distinct result. After an injection of 20 c.c., in the course of two months the weight

proportion was 230 gm. : 309 mg. The uterus was thickened, the mucosa hypertrophic, with a pronounced hyperemia.

Still more striking were the results with pineal extracts on animal No. 22. With a body weight of 440 gm. we reached a genital weight of 896 mg., so that the proportion amounted to 1:500. The uterine horns were violet red and thick; microscopically a marked hyperplasia was noted of the muscularis, and particularly of the mucosa, which showed a rich glandular proliferation. The ovary contained a corpus luteum. But these results also vary, and are inconstant. Animal No. 21 received the same quantity of epiglandol as animal No. 22, without showing any growth changes of its uterus. The weight proportion amounted to 310 gm. : 260 mg.

Just as ineffective was the action with hypophyseal extract. After injecting 20 c.c. of hypophysis-opton into animal No. 33, the weight ratio was 290 gm. : 172 mg. With extracts from the anterior lobe, (anteglandol) in animal No. 80, the weight relationship was 260 gm. : 212 mg. These facts were particularly brought out in order to emphasize the unreliability of endocrine extracts. We know from experimental investigations (Asehner) and from clinical experience, that a growth relationship does exist between the anterior pituitary and the genital organs. After hypophyseal extirpation the genitals remain infantile in type. Dystrophia adiposa genitalis is also often associated with hypogenitalism. The fact that injections of hypophyseal extracts fail to produce genital hyperplasia does not prove that our knowledge of the interrelationship between the gonads and the hypophysis is false, it merely shows that the extracts employed do not contain that active principle which the hypophysis secretes *in vivo*. In conclusion we also want to mention that thyroid extracts proved inert, while thymus extract gave once a very striking result, verified microscopically by an hyperplasia of the mucosa, with a glandular proliferation. The ovary showed a fresh corpus luteum.

A summary of these experiments shows that we can stimulate uterine growth to a moderate degree with the glandol preparations made from the ovary, the testicle, the epiphysis and the thymus; while extracts from the same glands, only differently derived (the opton groups) fail to produce hyperplastic changes in the genitalia. The opton preparation of the placenta, the hypophysis, (the whole gland and its anterior lobe alone), of the thyroid and of the other endoerines, also proved to be valueless as growth-promoting agents. This may lead to the conclusion that certain glands do stand in relationship to genital growth, but such a conclusion is, according to our opinion, scientifically unjustified: for (a), gland and gland extracts are by far not the same, and (b) the method of preparation, whether chemical, or tryptically fermentative, greatly modifies the experimental and the therapeutic results. We also wish to call particular attention to the

fact that we, in contrast to Puppel, obtained no results with placental opton. Puppel makes no definite mention of the time of the year during which his experiments were carried out, and relies upon his optical powers of observation in making his growth estimates and comparisons. Puppel experimented with rabbits, and if we were to admit that rabbits react differently than guinea pigs, then we would have to doubt the authoritativeness of all such investigations. Furthermore, if a growth-stimulating substance would act upon a rabbit's uterus and not upon that of a guinea pig, it would be impossible to draw conclusions bearing upon human physiology or physiologic pathology. Puppel obtained no results with ovarian opton—did not this strike him as rather unusual? The first evidences of the internal secretion of the ovary and its influence upon uterine growth recorded in the literature were based upon the fact that through the administration of ovarian extracts uterine hyperplasia was produced; and if he failed to stimulate uterine growth with ovarian opton, he should have known that some unfilled gap is still yawning between the known physiologic facts and his experiments. So that if Puppel got results with placental opton, and not with ovarian opton, it would imply that the placenta does promote uterine growth, while the ovary does not. It is not quite clear to us why he ascribes altogether to the placenta properties which influence genital growth in virgin animals; for this function, if at all possible, can only be exercised by the generative glands. Now, therefore, if Puppel could obtain no action with ovarian extracts, but with placental extract prepared under the same conditions, then the conclusion must follow that the preparations were faulty.

THE ACTION OF ALBUMINOID SUBSTANCES

If some gland extracts can stimulate the uterus to grow, while others remain inactive, then the supposition lies close at hand that we are dealing with a nonspecific general action. This supposition gained in certainty from clinical observations of Stickel and Zondek,²⁶ who noted reactions to glandular extracts that could not be explained on biologic grounds. For instance, if testicular extract can act as a hemostatic agent in uterine bleeding of oophorogenic origin, then we can no longer speak of endocrine function, but must acknowledge some unspecific influence. A good deal of confusion was brought into the realm of endocrinology through wanton conclusion based upon the results of only a few experiments. It is untenable to prepare an extract from a gland, inject this into an animal, ascertain a result, consider it as specific, and upon these few facts build an hypothesis about endocrine function and correlation. In this wise many conclusions were reached as to the effect of some extracts upon blood pressure, and the endocrines were subdivided into two groups, blood-raising and blood-depressing agents. We need not doubt, however,

that the effect upon blood pressure depends entirely upon chance products, particularly upon the albumin bodies. Only keen clinical observation, and exact scientific criticism may advance the knowledge of opotherapy. So long as a biologic effect, produced with a given gland extract, may be duplicated with a nonspecific substance which is closely allied to the particular extract, so long are we not justified in speaking of "specificity of function." It seemed to us as an essential part of our inquiry to test the function of albumin bodies, for there are palpable indications that the albumin split products which form in the gland extracts during the process of their production, are responsible for the observed and recorded growth phenomena. The previously described results obtained with de-albuminized gland extracts were also produced with fresh gland preparations whose albumin content was not separated.

The following investigation will show that protein injections are capable of stimulating growth and that the parenteral administrations of albumin bodies calls forth a general nonspecific heightened activity. After ten injections of sterilized milk (aolan), amounting to twelve c.c., a slight growth reaction was noted. Animal No. 27 showed a definite enlargement of its uterus, an hyperemia of the mucosa, and the weight proportion was 300 gm. : 322 mg. The other organs also showed evidences of hyperplasia. The spleen weighed 396 mg. in contrast to the normal weight of 363 mg. Still more striking were the results with larger doses of aolan. Animal No. 94 after receiving 15.5 c.c. showed a marked enlargement of its uterus, a weight ratio of 270 gm. : 381 mg. The spleen was also enlarged, weighing 450 mg. With injections of 20 c.c., the action was still more pronounced. The vagina and the uterus had a violet red color, strongly hyperemic, the uterine horns were thickened, musculature and mucosa hypertrophic and the weight proportions, (animal 28) were 260 gm. : 529 mg. The enlargement of the spleen in this case was extraordinary, reaching 960 mg., which is almost three times that of the normal. The adrenals were also enlarged, and weighed from 115 to 140 mg. against 84 to 94 mg. normally. Whether we are dealing in this case with a general growth stimulation, due to the large quantity of aolan and its rich albumin content can only be surmised, as the number of tests in this investigation is insufficient. It is noteworthy that no result was obtained with caseosan, the uterus did not enlarge at all, and the weight ratio was 295 gm. : 286 mg. The casein is therefore not the active principle, but we must ascribe the growth promoting properties to other protein bodies in the milk, such as albumin and globulin, or other albumin split products. *The main fact established by these experiments is that the growth activity may be promoted through parenteral administration of albuminoid sub-*

stances with as much success as with the proclaimed specific ovarian extracts.

THE ACTION OF THE BIOGENIC AMINO BODIES

The organic extracts usually employed are albumin free, hence it must be assumed that the growth manifestations consequent upon their use must be due to the finely split albumin products which can no longer be detected with the biuret test. To clear this doubt, we carried out a series of experiments with biogenic amido bodies, particularly with those pertinent to our subject. Gugenheim²⁷ in his excellent monograph, gave a review of our present day knowledge of proteogenic amino bodies. It seems to us that the manifold occurrence of these substances in most biologic processes, and their partly specific action, has not up till now been sufficiently appreciated. The formation of biogenous amino bodies in the higher plants and animals takes place through intracellular fermentative changes, and also through bacterial decomposition of nitrogenous matter (putrefaction). Inasmuch as the biogenic amino bodies of higher animals and plants are not formed synthetically, they must form hydrolytically, or through a methylizing process of amino acids. In cases of putrefaction as a result of bacterial decomposition this formation takes place through a decarboxylizing of the amino acids. In order to evaluate the significance of these substances in biology, it may be noted that the hydrolytic breaking up of the nucleonic acids leads to purin and pyrimidin bases, that the phosphatides split up cholin, and that the adrenal secretion, the adrenalin, belongs to the biogenous amino group.

Our tests with cholin lead us to the following conclusions: We know that cholin is present in all proteins of plant or animal derivation, it is therefore also contained in all organic extracts. We know that many effects, which were formerly considered as specific, like the lowering of blood pressure, are now known to be due merely to the presence of cholin in the organic extracts. But the effect of cholin upon uterine growth is negligible.

THE GUANIDIN COMPOUNDS

The guanidin compounds were recently studied very assiduously, and we also experimented with them. Guanidin is present abundantly in nature, either in a free state or in combination with its derivatives, the N homologues, which in the form of methylguanidin, creatin and arginin, play an essential rôle. Kossel called our attention to the directing rôle which arginin plays in proteid metabolism. The analysis of Kossel, Kutscher and Orgelmeister showed that arginin is present in almost all animal proteins: in the blood 2 per cent, in fibrin 3 per cent, muscle tissue about 4.7 per cent, kidney 4.2 per cent, heart 5.8 per cent, and liver 2.5 per cent. The ubiquity of this amino-

acid made us think that it may also be of importance in our investigation, but the experiments rendered a negative result. After twenty injections, amounting in all to one gm. of arginin nitrate, into animal No. 3, no growth increase of the uterus resulted. The weight proportion was 295 gm. : 210 mg. Neither did any of the other glands present evidences of growth increase.

Guanidin itself also proved to be functionless. After twenty injections, equal to 0.004 gm., the uterus remained thin and pale. The weight ratio was 295 gm. : 196 mg. The pharmacologic action of guanidin is to be conceived, according to Fuhrer²⁸ as that of a monovalent guanidinium ion, which is analogous, physiologically, chemically and pharmacologically, to the natrium ions. Just as the potassium salts, so do the guanidin salts stimulate the functional activity of the striated muscles (Gugenheim). Uterine growth is not influenced by guanidin.

THE IMIDAZOL COMPOUNDS

The imidazol compounds seemed to us to be of special biologic interest, since they are capable of calling forth biologic actions even in small doses. This is particularly the case with B-imidazolylethylamin, and histamin. This is derived from histidin through the action of microorganisms. Fungi as well as bacteria possess the property of decarboxylizing histidin and form histamin. We know at present about thirty different varieties of bacteria which are endowed with this property. It is therefore not surprising to find histamin in so many products of decomposition. We may mention that Barger and Dale²⁹ and Kutscher proved that histamin is one of the active principles of ergot, and that it may be found in the intestinal wall, in the feces, in the urine, and in all products of putrefaction. The pharmacologic tests of these amino bases rendered characteristic effects upon the involuntary or smooth muscle fibers of the vegetative organs. According to the quantity administered, there will follow either a rhythmical enlargement, with increasing tonicity, or a steady maximal tone. In addition to this, histamin also exercises a high autonomic stimulation. B-imidazolylethylamin is active in the most minimal doses. With a solution of 1:500 millions contractions took place in the isolated uterus and intestine of a guinea pig. Histamin lowers blood pressure, increases pancreatic secretion, and contracts the bronchi. It is quite interesting to note that the toxicity of histamin varies with different animal species. Sieburg³⁰ showed that a frog weighing 30 gm. will show no toxic effects from injections of 20 mg. of histamin, while according to Leschke³¹ a rabbit can only stand 12 mg. per kg. of body weight, and a guinea pig only 3.8 mg. We have found that the maximum dose for white mice, of an average weight of 30 gm., is 1.5 mg.; or 50 mg. when figured in kg. of body weight. The mouse

can therefore tolerate four times as much as the rabbit, and fifteen times as much as the guinea pig. In the human, even smaller doses of histamin than those used in the experiments proved to be toxic.

In order to study the effect of histamin, one of us injected himself subcutaneously with 0.4 mg., which is only $\frac{1}{10}$ of the guinea pig dose, and hardly $\frac{1}{100}$ of the dose for a mouse (calculated upon the body weight in kg). The effect was distinctly toxic, characterized by headache, dizziness, a feeling of anxiety and increase in the pulse rate. These symptoms lasted for about three hours. Further tests showed that subcutaneous injections of 0.2 mg. are well tolerated by human beings, while 0.3 mg. call forth the above described complaints. Intravenous injections of 0.02 mg. can unhesitatingly be tolerated by an adult human, while 0.03 cause headaches, etc. We shall take up the study of histamin somewhat more closely, for we believe that the amin base is of great importance for biologic processes and that it also plays no irrelevant part in human metabolism.

The fact that minimal doses of histamin call forth in the human marked reactions, with its concomitant toxic phenomena, and that these can be noted with the slightest increase in dosage, shows that even insignificant changes in the breaking up of the imidazol series may cause grave disturbances. The variance in the toxicity of the histamin dose in different animal species becomes evident when we calculate the dose of maximum tolerance upon the basis of body weight in kilograms. We obtain the maximum dose of histamin per kilogram of body weight as follows:

Frog	650 mg.
Mouse	50 mg.
Rabbit	12 mg.
Guinea pig	3.8 mg.
Human	0.4 mg.

If we increase the maximum dose in the human to 0.1 mg. per kg. of body weight, then the tolerance multiple in the guinea pig would rise to 400, 1200 in the rabbit, 5000 in the mouse and to 6500 in the frog. If we calculate the dosage upon the animal as a whole, then we find that a mouse weighing 30 gm. can stand five times as much histamin as an adult human being.

In previous experiments Zondek has shown that the hemostatic properties of some organic extracts (glandol preparations) are due to the contained proteogenic amino bodies. It can be proved that many endocrine extracts contain substances which cause contraction of the smooth muscles of the vegetative organs. Similar contractile powers are shown by extracts derived from liver tissue. If a process of albumin decomposition is undertaken, i.e., if we permit the liver tissue to undergo putrefaction then we will find in it muscle contracting sub-

stances in a high concentration. It is quite certain that these contraction producing substances are identical with those present in histamin, which are also the result of protein decomposition. It is also interesting to note that in the growth promoting substances, histamin is also an essential constituent. Histamin injections into guinea pigs cause with fair regularity an enlargement of the uterus, an increase in its thickness, and hyperemia. The effect was proportionate to the dose. After five injections, representing 3 mg. of histamin, the weight proportion was 275 gm. : 380 mg. After eighteen injections, amounting to 4 mg. of histamin, the weight relationship was 370 gm. : 369 mg. Histamin is therefore capable of increasing genital growth in infantile animals. The amount of histamin required for this purpose is quite large, 3 to 4 mg., for the guinea pig, which, as already stated, tolerates more histamin, or is far less sensitive to it, than the human being. The growth promoting function of histamin might possibly be ascribed to the continued contractions which it calls forth in the uterine muscle, in other words, to a work hypertrophy. Such a conclusion would be erroneous, for the experiments with amino bodies, which have a definite and specific contractile effect upon the uterus, failed to yield growth promoting results; histamin is therefore a growth stimulating specific.

PHENYLALKYL AND PHENYLALKANOLAMIN

From this group those amino bodies were tested whose biologic effect upon uterine contractions could be proved. These amino bodies contain a phenyl residue, by virtue of which the chemical as well as the pharmacologic properties of the aliphatic alkyls and alkanolamins are considerably changed. The naturally occurring fatty aromatic amino bodies originate presumably from proteins; this fact was long ago established with certainty for phenylethylamin and oxyphenylethylamin. For the other representatives of this group, like adrenalin, the protein relationship has as yet not been proved. We have tested tyramin (paroxyphenylethylamin) and the decarboxylizing product of tyrosin. The tyrosin belongs to the amino acids which are very quickly given off from protein. When casein and trypsin are digested *in vitro* there follows a deposit of tyrosin crystals on the walls of the container. Tyrosin is also found in human urine during metabolic disturbances, such as diabetic coma, phosphorus poisoning and prolonged anesthetics. Injections of tyrosin (eighteen injections aggregating 1.8 gm.) proved valueless in promoting uterine growth. The weight ratio corresponded to 300 gm. : 280 mg. Through a decarboxylizing process of tyrosin, tyramin is obtained; it is also present in ergot (Barger), and it may form during the process of digestion as a result of putrefaction. But, as tyramin undergoes a rapid change in the mammalian organism, its presence must be of a temporary nature only. The biologic effects

of tyramin have been carefully studied. We know that it raises the blood pressure, that it relieves bronchial spasms, and that it acts as a specific in stimulating the peripheral fibers of the sympathetic. By virtue of its specificity tyramin is capable of causing uterine and intestinal contractions, but in spite of this contractile power it is unable to promote uterine growth. After 20 injections of tyramin, amounting to 0.04 gm., into animal No. 30, we could not establish an increase in the size of the uterus. The weight ratio was 220 gm. : 186 mg.

Tyramin and histamin, which are contained in ergot, were recently employed as substitutes for the latter. It is claimed that tyramin is free from the toxic effects manifested by histamin, such as lowering of blood pressure, and is as efficient an oxytocic as is histamin. A mixture of both these substances (tenosin-Bayer) was shown by Zondek to be the best substitute for ergot. We have also tested out the effect of tenosin upon uterine growth, and have found that after injections amounting to 20 c.c., a very pronounced increase in the size of the uterus was noted, so that the weight proportion equalled 370 gm. : 630 mg. It is therefore certain that histamin possesses characteristic growth-promoting properties.

Adrenalin, the recognized active principle of the suprarenal gland, belongs to the same group. Our knowledge concerning adrenal function has advanced much further than that pertaining to the other endocrines, on account of our ability to produce adrenalin synthetically. In spite of this advantage we are still uncertain as to the biologic production of adrenalin within the organism; although it may be assumed that the rudiments of adrenalin must be looked for in one of the protein building stones (Bausteine), perhaps in tyrosin. The biologic functions of adrenalin on the other hand are definitely established, and we shall therefore consider only some of them. We know that minute doses of adrenalin stimulate the sympathetic and thus impart to the organs so innervated a sympathetic tone. Adrenalin contracts the peripheral blood vessels, thereby increasing the heart function, and raising the blood pressure. The pulmonary blood vessels remain uninfluenced by adrenalin, or they are not sympathetically innervated, in fact they undergo a slight dilatation. The effect of adrenalin on the uterus is expressed through a stimulation of the hypogastric nerves (Cushny). It is also interesting to note that the effect of adrenalin upon the uterus varies with the species, and also with the physiologic state of the uterus, whether gravid or not, in the same species. We must hence accept the fact that gravidity changes the nervous irritability of the uterus. Adrenalin causes uterine contraction in the rabbit, dog and ape; while in the cat, the mouse, and the guinea pig it causes uterine relaxation. The uterus of the virgin cat relaxes, and the gravid one contracts. Our experiments have

shown that 0.4 mg. of adrenalin, divided into nineteen injections were without any result. the uterus remained narrow and pale, the blood vessels partly filled; the weight proportion was 280 gm. : 220 mg. When the dose was increased to 2.6 mg. (divided into eighteen injections) in animal No. 99, a perceptible effect was noted. so that the weight ratio was 340 gm. : 620 mg. Notwithstanding the fact that small doses of adrenalin cause in the guinea pig a uterine relaxation, large doses are capable of promoting uterine growth. Whether this growth phenomenon is procured through the stimulation of the sympathetic cannot for the present be decided, since we do not as yet know what the sympathetic stimulation in the guinea pig is capable of rendering.

In conclusion we may also mention that the experiment with amino-valerianic-acids, alanin, aspargin and acetic-acid-ester. gave no result in reference to promoting uterine growth.

RÉSUMÉ

Briefly our results are as follows: By means of ovarian extracts (ovaglandols) we have frequently succeeded in bringing about an increase in the size of the uterus; with optons the result was negative. This is an additional proof of Zondek's conception that *the biologic action of organic extracts varies with the method and manner of their preparation*. We have obtained identical results with extracts of other glands (testicular and pineal) as with those of the ovary. Extracts of the anterior lobe of the pituitary yielded no results; although physiologically, a growth relationship between this portion of the hypophysis and the generative organs does exist. Genital growth may be stimulated by the administration of nonspecific biogenic amino bodies, which are the result of protein decomposition, as well as by the so-termed specific extracts. And since amino bodies may form in every organic extract, we must conclude that the slight increase in the size of the uterus noted after the administration of ovarian extract is not specific in nature. We cannot obtain a true endocrine effect with ovarian extract, for in the process of its preparation the active principle is destroyed.

REFERENCES

- (1) Hunt, R.: Am. Jour. Physiol., Jan., 1923, p. 257. (2) Hartman, F. A., and Hartman, W. E.: Am. Jour. Physiol., Aug., 1923, p. 623. (3) Mainzer, F.: Deutsch. med. Wochenschr., 1896, xxii, 188. (4) Fraenkel, L.: Arch. f. Gynäk., 1903, lxxviii, 438. (5) Burnam, C. F.: Jour. Am. Med. Assn., 1912, lix, 698. (6) Loch, L.: Jour. Am. Med. Assn., 1908, 1; 1909, lii. (7) Bouin and Ancel: Jour. de physiol. et Path., 1910, xii. (8) Frank, R. T.: Arch. Int. Med., 1910, iv, 314. (9) Adler, L.: Arch. f. Gynäk., 1912, cxv, 349. (10) Schickel, G.: Arch. f. Gynäk., 1912, xevii, 409. (11) Iscovesco, L.: Compt. rend. Soc. de Biol., 1908. (12) Fellner, O. O.: Arch. f. Gynäk., 1913, c, 641. (13) Herrmann, E.: Verb. der deutsch. Gesell. f. Gynäk., 1913, xi. Monatsschr. f. Geburtsh. u. Gynäk., 1915, xli, 1. (14) Aschner, I.: Arch. f. Gynäk., 1913, xcix. (15) Seitz, L. and Wintz, H.: München Med. Wochenschr., 1914, lxi, 1657. (16) Frank, R. T.: Surg. Gynec., and

Obst., 1915, xxi. (17) *Matsumata S. and Macht, D. I.*: Jour. of Urol., 1919, cxi, 63. (18) *Kohler, R.*: Zentralbl. f. Gynäk., 1915, xxxix, 667. (19) *Esch, P.*: Zentralbl. f. Gynäk., 1920, xlv, 561. (20) *Wintz, H.*: Arch. f. Gynäk., 1920, cxiii, 457. (21) *Frank, R. T.*: Jour. Am. Med. Assn., Jan. 21, 1922, p. 181. (22) *Frank, R. T.*: Jour. Am. Med. Assn., Sept. 29, 1923, p. 1133. (23) *Allen, E. and Doisy, E. A.*: Jour. Am. Med. Assn., Sept. 8, 1923, lxxxix. (24) *Zondek, B.*: Verhandl. d. deutsch. Gesell. f. Gynäk., 1922, xvii. (25) *Puppel*: Arch. f. Gynäk., cxvi. (26) *Stickel, M. and Zondek, B.*: Ztschr. f. Geburt. u. Gynäk., lxxxv, 83. (27) *Gugenheim, M.*: Die biogenen Amine. Springer, Berlin, 1920. (28) *Fuhrer*: Arch. f. exper. Path. u. Pharm., 1911, lkv, 401. (29) *Barger and Dale*: Jour. of Physiol., 1909, xxxviii. (30) *Seiburg*: Deutsch. med. Wchnschr., 1914, p. 2030. (31) *Leschke*: Ztschr. f. exper. Path. u. Therap., 1913.

1125 MADISON AVENUE.

A POSSIBLE FACTOR CONTROLLING THE WEIGHT OF THE NEWBORN. RELATIONSHIP OF THE AREA OF THE PLACENTA TO THE BIRTH WEIGHT OF THE CHILD BASED ON OBSERVATIONS IN ONE HUNDRED CASES*

BY RAE THORNTON LAVAKE, M.D., MINNEAPOLIS, MINN.

(*Assistant Professor of Obstetrics and Gynecology, University of Minnesota*)

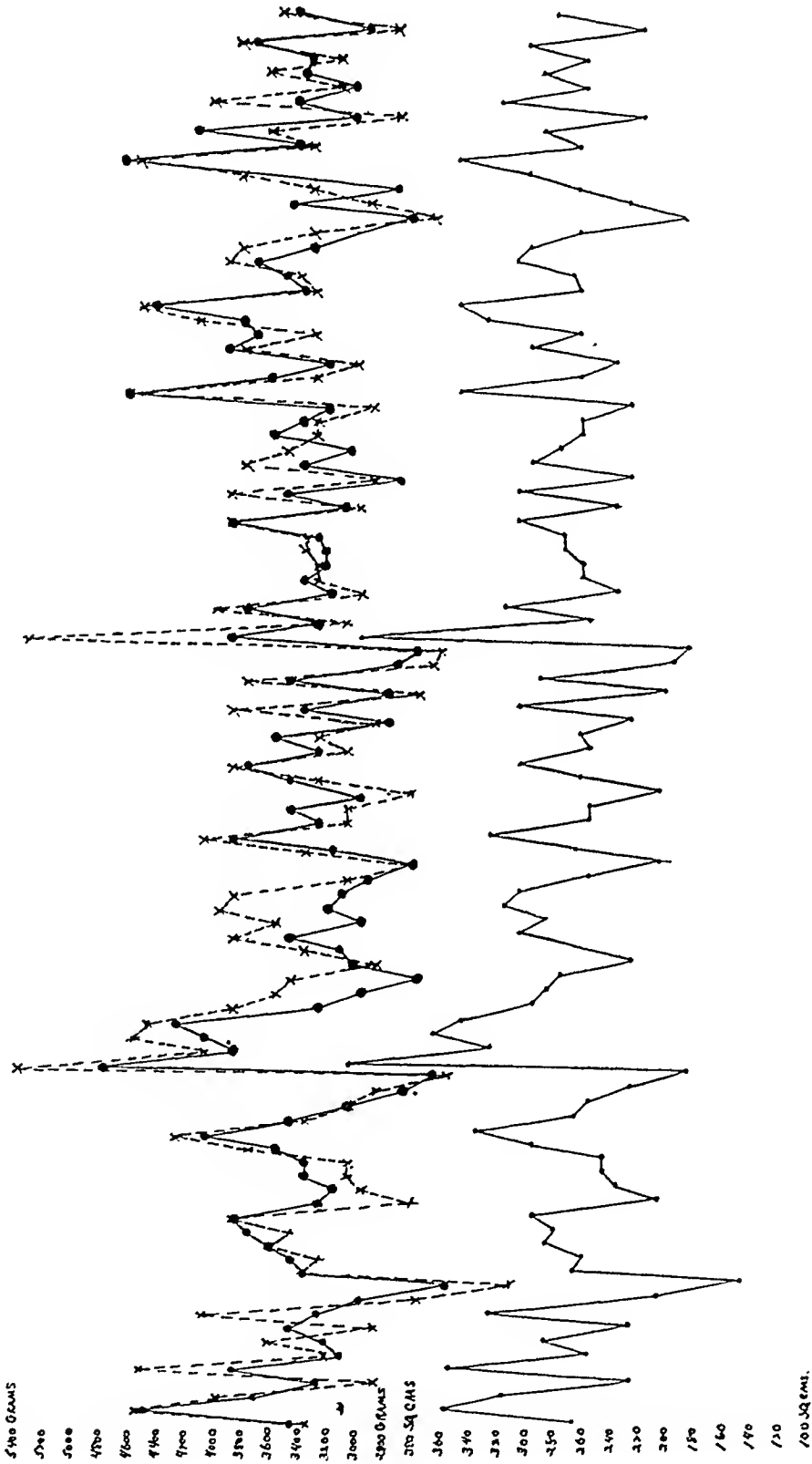
THE problem of birth weight, in cases of borderline measurements in the mother, has long been a subject of practical importance for all obstetricians. No doubt we have all tried to limit birth weight in such cases by various diets, the best known of which is that advocated by Prochownik. My results in such attempts have been signal failures. Women, under practically identical conditions of individual size, size of husbands and diet, have given birth to babies of widely different birth weight; large women, who could not be persuaded to control the extent of their diet, have had very small children; and little women, with small husbands and careful in their diet, have had children above the average birth weight. This experience has obtained in the practice of many obstetricians.

In regard to birth weight and diet, researches to date seem to show that, although overeating may add to the birth weight of a child, biologic facts do not show that restriction of diet below normal will noticeably influence or retard the growth of the fetus. Such restriction is only a detriment to the mother because the placenta will furnish necessary substances for the development of the fetus as long as they are available in the mother. If not available in excess of the needs of the mother, the fetus will develop at the expense of the mother.

In cases where large women had small babies and small women

*Read before the Clinical Club of Minneapolis, April 26, 1922.

Chart giving relationship of the area of the placenta to the birth weight of the child in one hundred cases.



Dotted line connects points giving estimated weight in grams of newborn figured from area of placenta in sq. cms. Upper black line connects points giving actual weight of newborn in grams. Lower black line connects points giving area of placenta in sq. cms.

had large babies, the concomitant feature which has nearly always attracted my attention has been the size of the placenta, large with large babies and small with small babies. The accompanying chart shows the relationship of the area of the placenta, in square centimeters, to the birth weight, in grams, in the last hundred cases coming under observation. I believe there is a parallel relationship. It is suggestive though possibly fortuitous in such a small series of cases.

The question will naturally suggest itself whether the weight of the placenta or a combination of the weight and the area parallels the birth weight more closely. Both relationships were tried but the parallel was not so marked, possibly because equal conditions of retained blood in the placentae could not be controlled.

The area of the placenta was arrived at in the following manner: Having determined that the placenta was intact, it was laid, uterine surface down on a hard surface, and flattened out by approximately a given pressure. A heavy, nonelastic thread was then laid around the edge, following the sinuositics, and then drawn straight and measured in centimeters. Taking this measurement as the circumference, the area was figured. The accuracy of the study was curtailed by the great likelihood of error in measuring the circumference. Several measurements of the same placenta varied frequently by from three to five centimeters which, if not corrected by an average of several readings, would cause a difference of as much as five hundred grams in estimating the birth weight. Even the average readings could only be viewed as rough approximations. Then again, no accurate determination was made of the area destroyed by infarctions, except to note that, in each instance where the actual birth weight fell below the birth weight estimated from the area of the placenta, in that placenta infarction was marked. In the first thirty cases the average quotient obtained by dividing the actual birth weight, in grams, by the area of the placenta, in square centimeters, was 12.5. In the next seventy cases this figure was used to estimate the probable birth weight of the child, after obtaining the area of the placenta. Even with this inaccurate quotient, 12.5, because taken from such a small number of cases and under the handicap of marked inaccuracies in determining the actual functioning area of the placenta, represented by the noninfarcted area of the placenta, it was interesting to note how closely one could estimate the birth weight of the baby in the great majority of cases.

If this parallel between the area of the placenta and the birth weight is not fortuitous, the deduction possibly to be drawn is that the impregnated ovum having the most proteolytic power "digs in" the deepest in the uterus with the final formation of the largest pla-

centa, thereby assuring the greatest possible access to the food supply, resulting, other factors being equal, in the largest birth weight. This deduction, if warranted, would have only suggestive significance because I believe the preponderance of biologic evidence points to the fact that the potential size of the child at birth resides in the impregnated ovum from the start. This potential might very likely parallel the proteolytic energy of the ovum, thus accounting for the size of the placental formation, which is believed by some to be the result of protective mechanism on the part of the maternal structure to limit further proteolysis. Again, if this deduction can be drawn, the logical corollary would be that impregnated ova of diminishing degrees of proteolytic power would likely be swept nearer and nearer to the internal os before being able to "dig in" with resultant lateral, partial and central placenta previa formations. I have no data outside of cases too few to be of any significance, which would tend to substantiate the usual presence of small placentae in cases of placenta previa delivered at term.

Another logical corollary would be that, even with normal tubes, ectopic pregnancy may be accounted for by the high proteolytic power of the developing ovum which causes it to "dig in" before reaching the uterine cavity. This would account for the frequency of later ectopic pregnancy in the opposite tube, left in at the time of operative interference in the first ectopic pregnancy because of the apparent normality of this tube.

This chart, with possible deductions therefrom, may be of practical value only as it may add evidence in corroboration of the experimental and clinical futility of the attempt to produce subnormal birth weight by dietary regime, which is not one of the primary factors in control of birth weight. In directing the diet to subserve the strength and well-being of the mother we subserve the best interests of both the child and mother. Necessary obstetrical maneuvers and operations with a strong, healthy mother offer greater chances of success than any restriction of diet below the adequate needs of the mother in the effort to diminish the size and weight of the child at birth and thus bring about a more easy labor.

REFERENCES

- Murlin*: Am. Jour. Obst., 1917, lxxv, 913. *Slemons*: Am. Jour. Obst., 1919, lxxx, 194. *Ehrenfest*: Am. Jour. Obst., 1919, lxxx, 441.

DONALDSON BUILDING.

THE INCIDENCE AND SIGNIFICANCE OF UROGENITAL SYMPTOMS IN GYNECOLOGIC PATIENTS*

BY WALTER T. DANNREUTHER, M.D., F.A.C.S., NEW YORK CITY

(Associate Professor of Gynecology, New York Post-Graduate Medical School and Hospital; Attending Gynecologist, St. Elizabeth's Hospital; Consulting Female Cystoscopist, Lutheran Hospital.)

AFTER four years in general practice, and another four of gynecology, I acquired a working knowledge of cystoscopy in 1914. During these eight years women complaining of symptoms referable to the urinary tract were treated for "cystitis" without any real study of the urinary pathology, unless the severity of symptoms demanded consultation with a urologist. Since 1914, however, such patients have received the benefit of a cystoscopic examination, supplemented by such further urologic investigation as was deemed necessary. Retrospection now convinces me that: (1) many gynecologic patients manifest symptoms referable to the urinary tract; (2) in women, there is such a close relationship between the pelvic and urinary organs, that symptoms originating in one group are frequently referred to the other; (3) no gynecologist is equipped for the practice of his specialty until he becomes proficient in cystoscopy; (4) it is not necessary that the gynecologist become a urologist, but he must be qualified to recognize lesions of the urinary tract promptly and treat them intelligently; and (5) these facts are not appreciated by all gynecologists.

My own early sins of omission and the observations made during the last ten years have so inculcated the truth of these aphorisms that herewith I venture to submit a review of 600 consecutive private case records. No dispensary or hospital ward records have been included, because histories taken by different individuals lack uniformity, and patients coming to the ward service are usually selected cases and candidates for some definite gynecologic operative procedure. No obstetric cases are included in this presentation.

While I have no inclination to compile a series of statistical tables, which, as has well been said, "may be made to prove anything, even the truth," yet the occurrence of urinary diseases in gynecological practice and the relative significance of the several symptoms discovered in the analyses of these histories must necessarily be gauged to a considerable extent by their mathematical frequency.

*Presented as a thesis for admission to Fellowship at the Thirty-sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Philadelphia, Pa., September 19-21, 1923.

A study of the case records reveals:

Patients having no urinary symptoms	481
Patients having some pathologic condition of the urinary tract, or symptoms referable to it	119
Total	<u>600</u>

It is therefore evident that 20 per cent of patients consulting the gynecologist require cystoscopic examination to establish a diagnosis. Of the 119 patients constituting the basis of this investigation, 53 had urinary symptoms only, while 66 had both urinary and pelvic symptoms. But the fallacy of relying upon symptomatology for diagnosis is well illustrated by the causative factors discovered:

Patients having lesions of the urinary tract	51
Patients having lesions of both the urinary and pelvic organs	44
Patients having lesions of the pelvic organs only	14
Patients having urinary symptoms due to remote causes	10
Total	<u>119</u>

In the 95 patients having actual disease of the urinary tract, either alone or associated with some pelvic lesion, the following pathologic conditions were present:

Pyelitis		18
Acute		
Suppurative	7	
Hemorrhagic	1	
Chronic	10	
Trigonitis		
Cystocele		15
With irritation of bladder	11	
With trigonitis		
Urethral caruncle		10
Uncomplicated	4	
With chronic pyelitis	2	
With cystocele and trigonitis	1	
With trigonitis and urethritis	1	
With supernumerary ureter		
With supernumerary urethra	1	
Urethritis		8
Acute cystitis		6
Prolapsed kidney		6
Uncomplicated	3	
With chronic pyelitis	2	
With hydronephrosis	1	
Renal calculus		3
Ulcerative cystitis		3
Ureteral stricture with chronic pyelitis		2
Periurethral abscess		2
Renal tuberculosis		2
Bilateral polycystic kidney		1
Pyonephrosis		1
Relaxed vesical sphincter		1
Papilloma of bladder		1
Carcinoma of bladder (secondary)		1
Total		<u>95</u>

A general survey of these cases discloses many facts of clinical importance, but before discussing the several diseases separately, I desire to call attention to the practical value of two easily utilized diagnostic

aids; catheterization of gynecologic patients, and the routine use of the indigo-carmin renal function test.

Catheterization of Gynecologic Patients.—An empty bladder is a prerequisite for satisfactory bimanual examination. To preclude contamination, a specimen of urine must be fresh, obtained by catheter, and drawn into a sterile receptacle. I have, therefore, adopted the practice of catheterizing all gynecologic patients on their first visit, collecting the specimen in a long sterile test tube, after the fashion of the urologist. This method not only insures complete emptying of the bladder before making the pelvic examination, but also affords an excellent opportunity to examine the urine "body," with reference to its physical properties. Turbidity, discoloration, and the flakes, filaments, and shreds suspended in the urine are detected by twirling the tube. The same urine is available for smears or cultures, should they be deemed necessary. There is often a decided difference between the appearance of a freshly catheterized specimen and one contaminated by passing the vulva, and brought in a bottle by the patient after the lapse of considerable time. The advantages of catheterization are obvious. Inspection of hundreds of catheterized specimens of urine from women warrants the following conclusions:

Discoloration of the urine is due to the presence of blood, bile, or some chemical agent.

Turbidity of a milky character, cleared by adding a few drops of acetic acid, is due to phosphaturia.

Turbidity of a milky character, not cleared by acetic acid, is due to bacteriuria.

Flocculent material that does not tend to settle to the bottom of the tube is mucus.

Flocculent material that becomes "ropy" on twirling of the tube, and tends to settle afterwards, is pus.

Visible small granular flakes, equally distributed throughout the urine "body" are often a manifestation of pyelitis.

Large flakes and shreds usually come from the bladder or urethra, and often denote a cystitis or urethritis.

Indigo-Carmin Renal Function Test.—Of all the renal function tests, this one is probably the most easily applied and consumes the least time. Although it does not represent the metabolic capabilities of the patient as accurately as the phenolsulphonephthalein, it quickly indicates any impairment of renal function or ureteral obstruction on one or both sides. I would strongly urge that the gynecologist carry it out in every patient with chronic appendicitis, cystic ovaries, and other diseases to which pain in the lower abdomen is so often ascribed, before subjecting the patient to operation, as its behavior may suggest the presence of some lesion in the kidney or ureter, which in reality is

producing the symptoms erroneously attributed to coexisting pelvic pathology. When the indigo-carmin is given intravenously, the technique is simple, elimination rapid, and the test reliable.

Pyelitis.—The most striking feature of this disease is the frequency with which it occurs in women. Adding the two cases of urethral caruncle, the two of prolapsed kidney, and the two of ureteral stricture, in which there was a coexisting pyelitis, to the 18 uncomplicated cases, makes a total of 24; 25 per cent of the whole number of the diseases of the urinary tract. Practically all of these, of course, showed a concomitant involvement of the bladder in the inflammatory process, so that although intravesical treatment would have failed to cure, a diagnosis of "cystitis" would not have been entirely wrong.

While many of these patients unquestionably acquired pyelitis as a lymphogenous or hematogenous infection, secondary to their constipated tendencies or focal infections, I have been impressed by the number of instances in which the onset in the under-nourished, anemic type of individual has followed sea bathing in the late summer months. In such cases, when the patient was at a resort, the local physician usually made a correct diagnosis during the acute stage, but limited his treatment to medical measures. Several of the patients with chronic pyelitis had been treated for variable periods of time by other physicians with indifferent success. All required irrigations of the renal pelvis through a ureteral catheter for cure. The acute cases were all suppurative but one, which was hemorrhagic in character.

Fourteen patients had previously been treated unsuccessfully by other physicians for periods of from three weeks to 23 years; 1 for three weeks; 2 for 4 months; 3 for 6 months; 5 for 1 year; 1 for 2 years; 1 for 10 years; and 1 for 23 years. The patient who was treated for 23 years had many nervous symptoms and had been in the hands of another gynecologist for a long time. Apparently in desperation he had cut down on the right kidney because of severe lumbar pain seven years before I saw her, without a preliminary cystoscopic examination. This woman was completely cured in six months by instillations of silver nitrate into the renal pelvis.

The urine from patients with pyelitis without exception showed alterations in its macroscopic appearance. Those with acute inflammation had a pronounced pyuria or bacteriuria, while those with chronic involvements showed small granular flakes or small shreds in the catheterized specimen. Four of the acute cases also had hematuria, in three of which the pyogenic features predominated and the bleeding occurred intermittently. In the other case, the hematuria represented a real hemorrhagic pyelitis.

Colon bacilli were found in the urine in 16 cases, staphylococci in 7, and streptococci in one case.

The elimination of indigo-carmin was delayed beyond 6 minutes from the affected side or sides in 18 cases, but never more than 12 minutes.

In each case of pyelitis there was an inflammatory involvement of the bladder, so that a certain degree of cystitis may be accepted as a concomitant of the disease, the acuity of the bladder inflammation often corresponding to the intensity of the pyelitis. The bladder capacity was markedly diminished in two cases of suppurative pyelitis, to 5 ounces and 3 ounces respectively, and in both instances there was a pronounced cystitis.

Of the 24 patients, 16 had urinary symptoms alone, and eight urinary and pelvic symptoms combined. Only two had an associated pathologic condition of the pelvic organs to which some of the symptoms might fairly be attributed (retroversion of the uterus in both instances). The menopause was incidental in two other cases. The most common symptom was frequency of urination; diurnal and nocturnal in 19 patients, and diurnal only in two others; three were entirely free from this annoyance. The next most constant symptom was lumbar pain or discomfort. This occurred in 18 patients, while hypochondriac distress on the affected side was mentioned only five times. When a woman talks about "backache," it is a good idea to make her indicate its exact location by putting her hand on it. This is certain to prevent the not infrequently made mistake of assuming that she refers to the sacral region, when she really means the lumbar, and a mobile retroverted uterus will not be unjustly accused of causing it. Inguinal pain was noted in three cases: in the two of ureteral stricture with chronic pyelitis and in one case of prolapsed kidney with pyelitis. Urgency of urination appeared, seven, suprapubic discomfort, seven, burning sensation on voiding, five, tenesmus, three, and urethral discomfort three times. Pyrexia was observed in all cases of acute pyelitis, but in none of the chronic cases.

Trigonitis.—This is defined by Dorland as "an inflammation or localized hyperemia of the trigone of the bladder," which actually implies a chronic cystitis. When preceded by acute cystitis, the primary inflammation usually involves the entire bladder wall. This subsides rapidly, and except in those cases in which resolution and recovery are complete, there remains a chronic inflammation, which is either restricted to or more pronounced in the region of the trigone. On the other hand, a large number of cases are insidious in onset and chronic from the beginning. A certain degree of trigonitis invariably accompanies chronic pyelitis, so that the number of patients having this latter condition must be added to those with trigonitis alone. If all these are grouped with all the cases having acute inflammations, it is quite evident that the diagnosis of "cystitis" will be at least partially correct in about 50 per cent of gynecologic patients having urinary symptoms. The term "trigonitis," as generally used, refers to a chronic cystitis, limited chiefly to the region of the trigone, and usually seen as a trigonitis

pseudomembranosa or cystitis cystica. In chronic ulcerative and hemorrhagic cystitis the pathologic processes extend so far beyond the confines of the trigone that they cannot properly be included in this category.

The catheterized urine from every one of the cases of uncomplicated trigonitis showed either turbidity or comparatively large flakes and shreds. Cultures developed colon bacilli in nine cases, staphylococci in three, and micrococci catarrhalis in one case. In two instances no microorganisms could be recovered: one in which the trigonitis was apparently due to extraneous causes (postoperative adherent anteversion of the uterus) causing extravescial pressure, and another in a patient coming for the relief of bladder symptoms after a nephrectomy for pyonephrosis by another surgeon. One patient had been treated for six months by a general practitioner, and was referred to me for "tuberculosis of the bladder." The doctor stated that on one occasion he had found tubercle bacilli in the urine. He had undoubtedly examined a voided specimen, contaminated by contact with the vulva, and mistaken the smegma bacillus for the tubercle bacillus. Such an error is unlikely if the bladder is catheterized. In no case was there any reduction of the normal bladder capacity.

Indigo-carmin was eliminated from both ureters in less than six minutes in all cases.

Both urinary and pelvic symptoms were present in seven of the 15 patients, and six of these had coincident pelvic disease, the other had an intestinal stasis causing pelvic symptoms. Diurnal frequency occurred in 12 patients, and nine of these had nocturnal annoyance too. One patient had nocturia without any during the day. Two had urgency and tenesmus without any frequency whatever. The patient who had had a nephrectomy complained of dull discomfort in the lumbar and hypochondriac regions on the opposite side, probably due to compensatory hyperactivity of the remaining kidney. Only one other patient had hypochondriac pain, and this was due to cholecystitis. Six patients had urgency, 3 tenesmus, 3 suprapubic discomfort, and 1 impaired bladder control. No patient complained of urethral discomfort, burning on voiding, or inguinal pain, and none had any elevation of temperature.

Cystocele.—Many patients with cystocele are free from urinary symptoms. In these cases the prolapse of the bladder is not very extensive or the patient comes under observation early. But others do have annoyances which can justly be referred to the bladder. In these cases cystoscopy is of material aid, for should a trigonitis be present, it is only fair to warn the patient that the operative correction of the cystocele is but the first step in her treatment and subsequent intravesical instillations will be necessary. Otherwise the persistence of symptoms after operation will be disappointing. When the cystocele is pronounced

there is always some distortion of the bladder which gives rise to at least a capillary congestion. This, together with the tendency to urinary stasis, renders the bladder particularly susceptible to microbial invasion. The fifteen cases considered as representing purely a pathologic condition of the urinary tract include only the ones attended by urinary symptoms.

The physical properties of the urine are not affected by the extent of the cystocele, but are entirely dependent upon the intravesical inflammation and infection. The urine was clear in all the patients except the four in whom cystoscopy showed a definite trigonitis. In these there was turbidity, with large flakes or shreds, and colon bacilli were found in each one. The cystocele was accompanied by complete uterine prolapse in three cases, there being about one ounce of residual urine in each instance. One of these patients apparently had a diminished bladder capacity, as she could not tolerate more than three ounces of fluid, but this was probably due to extreme irritability of the mucosa rather than to actual contraction of the bladder wall.

All but one of the 15 patients had both urinary and pelvic symptoms and all had some coexisting pelvic lesion, while one was also syphilitic and another had a definite hyperthyroidism. The patient with urinary symptoms only had a huge cystocele, but only a moderate perineal laceration with it. The most characteristic symptom in cases of cystocele seems to be that on lying down the patient experiences relief from all her other urinary symptoms, whatever they may be. Diurnal frequency occurred in 11 of the 15 cases, but only two complained of nocturnal annoyance. Another had nocturnal frequency only. Control was impaired in five patients, varying from occasional dribbling to involuntary voiding on coughing, sneezing, and exertion, and actual incontinence. In two of these the vesical sphincter was decidedly relaxed, and all but one (the syphilitic patient) were cured by a Kelly operation on the vesical neck and correction of the cystocele. Only four patients complained of urgency, and they were the four with trigonitis. All these women with cystocele were conscious of "something coming down."

Urethral Caruncle.—In view of the fact that in six of the ten cases of caruncle there was an additional pathologic condition of the urinary tract, it is obvious that removal of the caruncle would not always have sufficed to relieve the patient entirely.

One of the two cases associated with a urogenital anomaly was unique. This patient complained of sharp urethral pain and burning on urination, with some diurnal frequency probably due to circulatory hypertension. Examination disclosed a small, exquisitely sensitive excrescence on the vestibule, just below the normal external meatus. A probe, pushed through a tiny slit in its center, met with little resistance and traversed a path upward, backward, and to the right. Having

introduced a cystoscope into the bladder, the probe was seen to emerge through an aperture in the bladder wall, a little above and to the right of the right ureteric orifice. This patient had a second anomalous urethra, at the orifice of which was a caruncle. Removal of the latter effected a prompt cure of the patient's symptoms. The canal was later inspected through a small Kelly endoscope, and found to have a mucous membrane lining.

A caruncle does not produce any change in the character of the urine, so that alterations in its appearance are of course due to some other cause. Likewise, all symptoms other than urethral discomfort and burning are due either to some complicating factor or reflex irritation. Diurnal frequency, which occurred in nine of the ten cases, and urgency of urination may fairly be attributed to the latter. The patients having a concomitant pyelitis, trigonitis, or urethritis manifested the diversity of symptoms which these conditions are capable of producing.

Urethritis.—Of the eight cases of urethritis, seven were due to gonococcal infection and one to the micrococcus catarrhalis. Half the cases were acute when first seen, and the others chronic. In the acute stage the diagnosis was proved by urethral smears; in the chronic stage by smears and urethroscopy. The urine was turbid, containing large flakes and shreds, while the infection was active, and gradually cleared as the inflammation subsided. One patient with acute gonorrheal urethritis had a simultaneous perineal chancre, another an acute Bartholin abscess, and another an acute salpingitis. All eight had diurnal frequency, but only six had nocturnal annoyance. Burning on voiding occurred in six, urgency in six, urethral pain in two, and tenesmus in two cases.

Acute Cystitis.—A tentative diagnosis of acute cystitis can be made from the intensity of the symptoms, and cystoscopy or any other form of instrumentation is temporarily contraindicated. Acute cystitis, *per se*, can be differentiated from acute pyelitis, which may be accompanied by a cystitis, by the absence of fever. Fever was not observed in any case of infection limited to the bladder.

In every case there was a frank pyuria due to the colon bacillus. In many cases of acute colon bacillus infection of the bladder it is difficult to account for the migration of the microorganisms from the colon through the blood or lymph channels, and in several instances of this kind I have attributed the infection to the careless personal habits of some women. It does not require much imagination to conceive of a smear of colon bacilli being transmitted from the anus to the vulva.

Diminution of the bladder capacity to five ounces was noted in three patients. This was only a transitory intolerance, the capacity increasing with alleviation of the inflammation.

The symptoms produced by the intravesical acute inflammation are so severe that the patient's attention is distracted from any other annoyances that she may have at the same time. For this reason, none of the

six patients mentioned anything but the urinary symptoms. While their nature does not differ from the symptoms arising from urinary disease, acute cystitis is characterized by the intensity of the symptoms. Not infrequently they are agonizing. All six patients had diurnal frequency, and all but one nocturnal frequency; five had burning on urination, four suprapubic pain, three urgency, three tenesmus, and one urethral pain. The absence of hematuria and pyrexia in all six cases is significant.

Prolapsed Kidney.—Not so many years ago, well within my recollection, all sorts of vague abdominal, pelvic, and nervous symptoms were ascribed to "prolapse of the kidney," if the kidney came down sufficiently on deep inspiration to permit of palpation. The number of women unnecessarily operated upon in the past for this condition had best be forgotten. As a rule, renal prolapse is simply an easily identified participant in a general visceroptosis. When a kidney prolapses as far as the true pelvis, however, there are two definite indications for radical and permanent corrective measures: Dietl's crises, produced by torsion of the pedicle, and damage to the renal histologic structures, caused by obstructed urinary drainage. The six cases classified as prolapsed kidney in this series complied with the above principles, the kidney having migrated to the pelvic region. The three that were uncomplicated required nephropexy for the relief of typical Dietl's crises, while the one with hydronephrosis had such extensive destruction of renal tissue that nephrectomy was necessary. Once the vicious circle of obstructed drainage, back pressure, urinary stasis, and infection becomes established, correction of the prolapse is imperative.

The character of the urine is of course influenced by the complicating factors, such as nephritis, pyelitis, and infection. Colon bacilli were found in the specimens from the 2 cases with pyelitis, and staphylococci from the one with hydronephrosis.

The elimination of indigo-carmin was delayed beyond the maximum normal time limit in all cases. No trace of color was seen coming from the hydronephrotic kidney, after twenty minutes observation.

Pelvic symptoms were present in addition to the urinary symptoms in four cases, being due to a large ovarian cyst, a large intraligamentary cyst, the menopause, and chronic intestinal stasis respectively. Typical Dietl's crises occurred in three patients. Increased frequency of urination was not a constant symptom, being noted in only three cases. Hypochondriac discomfort or pain was present in four, lumbar in three, and inguinal in one case. The inguinal pain was probably due to a large ovarian cyst on the same side, rather than to the renal prolapse.

Renal Calculus.—An elderly woman had been treated by another

physician for two years for "lumbago." Roentgenography disclosed two small calculi in the lower pole of the right kidney. Another middle-aged woman had had her gall bladder removed for the relief of pain in the right hypochondriac and lumbar regions, but the same symptoms persisted after operation. Again the x-ray revealed calculi in the right kidney. The third patient had been advised to have her left "cystic ovary" removed for the relief of pain in the right inguinal region which radiated to the groin, and requested me to verify the diagnosis and agree that operation was necessary. Since I could not determine any enlargement of the ovary, an indigo-carmin function test was done. No dye escaped from the ureter until 15 minutes had elapsed, and only traces appeared after that. A wax-tip ureteral catheter was arrested 11 cm. from the ureteric orifice, and the wax bulb showed deep scratches on its surface. Subsequent x-ray examination disclosed a large calculus in the left ureter. These cases well exemplify the desirability of utilizing a renal function test on the slightest suspicion of trouble in the urinary tract.

The urine from the first patient showed evidences of chronic interstitial nephritis. That from the other two was normal.

The elimination of indigo-carmin was delayed on both sides in the first patient, probably because of the nephritis rather than the calculi. In the second and third patients there was a decided interference with the ejection of the dye from the affected side.

All three patients had pain in the hypochondriac region, corresponding to the location of the calculi, and the two with stones in the kidney substance had lumbar pain as well. The patient with a stone in the ureter had pain along the crest of the ilium, which disappeared on lying down. All three had diurnal frequency without any at night.

Ulcerative Cystitis.—Syphilis and tuberculosis were excluded in the three cases placed in this category. Ulcerative cystitis seems to be characterized by a more or less general involvement of the bladder, irregularly distributed areas of small ulcerated spots, and an inflammatory reaction of the subacute type, with a corresponding severity of the accompanying symptoms.

The urine "body" contains large flakes and shreds, and epithelia from the middle and deep layers of the bladder wall can be found microscopically. Any of the more common pyogenic microorganisms may produce an ulcerative cystitis. In one of the three cases the bladder capacity was reduced to four ounces, and in another to five ounces.

Diurnal and nocturnal frequency were pronounced in all three cases. Urgency was intense in two, burning on voiding in one, tenesmus in one, and hematuria in one patient. In an elderly woman the bladder

control was distinctly impaired, but this could not be attributed entirely to the cystitis.

Ureteral Stricture.—For several years Hunner of Baltimore has insisted that stricture of the ureter occurs frequently in women. The most significant feature of the two cases encountered in this series is the fact that the strictures escaped detection and the patients suffered unnecessarily for a comparatively long time. In the first case the patient was subjected by another operator to a left oophorectomy and resection of the left tube two years before I saw her. As her symptoms persisted thereafter, she was referred to me by her family physician, and I made the mistake of operating upon her again, without doing an indigo-carmin function test first. At this time I removed a hydrosalpinx in the stump of the left tube, and the right ovary, which had become cystic. Only when I found that the symptoms still continued after this operation did I appreciate the necessity for a urologic investigation. The elimination of indigo-carmin was delayed on the left side, and the ejected stream was small and sluggish. Subsequent ureteral catheterization and pyelography demonstrated a narrow stricture of the left ureter, dilatation of which, together with a few irrigations of the renal pelvis, entirely cured the patient. It was this case which caused me to adopt the practice of doing a function test before all elective gynecologic operations. In the second case, the patient's physician had treated her for extreme nervousness and other symptoms for more than a year.

The urinary changes are those which are usually found in cases of chronic pyelitis, which nearly always follows a stricture of the ureter, if the latter has existed for any length of time.

The behavior of the indigo-carmin function test is often suggestive. Not only is the elimination delayed on the affected side, but the caliber of the stream is reduced, and the dye dribbles from the ureter instead of appearing in forcible spurts.

Both patients had diurnal and nocturnal frequency, and a discomfort along the crest of the ilium. Both also suffered from various nervous symptoms, which disappeared after a cure was effected. No other symptoms were present.

Periurethral Abscess.—This condition is undoubtedly a sequel of urethral infection, but both patients presented themselves with a well defined abscess already formed. One had previously ruptured into the urethra, and the other did so before the patient reached the hospital for operation. The urethral sinus closed promptly, however, in each instance, as soon as the abscess wall was excised, and the cavity healed by granulation. Subsequent topical applications soon cleared up the urethritis.

The urine in both cases contained pus, and the quantity excreted

from the urethra was so excessive that the patients complained of leucorrhœa, although neither had a real vaginal discharge. Cultures from the abscess cavity showed colon bacilli in one case and staphylococci in the other. No gonococci were found in smears from the urethra, vagina, or cervix in either case.

The chief complaint of both patients was urethral pain. One had urgency, and the other burning on urination. These were the only symptoms except the supposed leucorrhœa. Neither had any increased frequency of urination.

Renal Tuberculosis.—While only two cases of urogenital tuberculosis were encountered in this series of private patients, the incidence of this condition in hospitals and dispensary practice is considerably higher. The subject is one of such importance and of so many ramifications that the limitations of this paper permit but a brief allusion to the most salient points. (1) the patient's symptoms are usually referred to the bladder, seldom to the kidney, and differ little from those produced by other lesions of the urinary tract; (2) tuberculosis cystitis is invariably secondary to renal tuberculosis; (3) these patients particularly are apt to go from one physician to another without a correct diagnosis being made; (4) the tubercle bacilli are often extremely difficult to find in the urinary sediment; and (5) local treatment of the cystitis is useless until the offending kidney is removed.

Urogenital tuberculosis should be suspected in women when the bladder is intolerant of even bland fluids; when the capacity is reduced to four ounces or less; when cystitis fails to respond to the ordinary remedial measures after a reasonable length of time; when intravesical irrigations with silver nitrate aggravate the patient's symptoms; when there is more involvement of one lateral half of the trigone than the other; when there is a linear ulcer on the anterior wall or obstinate ulcers elsewhere; and when there is marked distortion of a ureteral orifice.

One of the two patients had been in the hands of other physicians for one year; the other for five years. The urine was fairly clear and highly acid in one, but was turbid in the other, probably because of mixed infection. In one case the tubercle bacilli were found easily; in the other they were discovered only after repeated search. The bladder was extremely intolerant in both cases.

No indigo-carmin was excreted from the diseased kidney within 20 minutes after intravenous injection in either instance. The ureter on the affected side in both cases was so involved that a No. 5 ureteral catheter could not be introduced.

Both patients had pronounced diurnal and nocturnal frequency, suprapubic discomfort, and afternoon pyrexia. One had urgency and tenesmus. The other had lumbar and hypochondriac pain, largely

due to perinephritic suppuration. Neither had hematuria. Both patients were cured by nephrectomy, followed by intravesical irrigations.

Miscellaneous.—The patient with bilateral polycystic kidneys is now thirty-eight years old, and has been under observation for seven years. During this period she has been successfully operated upon for complete prolapse. Both kidneys are tremendously enlarged and she suffers considerably from lumbar and hypochondriac discomfort. Nevertheless, her general health remains fairly good.

The patient with pyonephrosis was referred for an opinion by a general surgeon, who proposed to do a hysterectomy for fibroid, but hesitated because there were "many pus cells in the urine." The patient had diurnal and nocturnal frequency, lumbar pain, urgency of urination, and fever. I persuaded the doctor to do a nephrectomy and defer the contemplated hysterectomy.

The patient who had a papilloma of the bladder mentioned "bladder irritability" while suffering from acute appendicitis. After the appendectomy, frequency, urgency, and tenesmus still persisted. Cystoscopy disclosed the bladder tumor, which was removed by fulguration.

A relaxed vesical sphincter was found in several of the patients previously mentioned, but in one case was not associated with any other lesion of the urinary tract. This patient's impaired control was corrected by a Kelly operation on the vesical neck.

The patient who had carcinoma of the bladder suffered from an advanced carcinoma of the uterus, and lived but a short time after coming under observation. She had frequency, urgency, and hematuria.

In only a little more than 11 per cent of the 119 patients with urinary symptoms were the symptoms due entirely to lesions of the pelvic organs. The lesions in these cases were:

Fibromyoma of the uterus		6
Corpus	5	
Cervix	1	
Post-operative anteversion, with immobilization		2
Ovarian cyst		1
Pyosalpinx		1
Ectopic gestation		1
Varicosities—broad ligaments		1
Bartholinitis		1
Chaneroids		1
Total		<u>14</u>

In every instance the urine was clear and free from pathogenic microorganisms. All these patients had coincident pelvic symptoms, except the two with postoperative anteversion of the uterus.

All six patients with fibromyoma of the uterus complained of fre-

quency of urination, but in only two did it cause nocturnal annoyance. In two others urgency was marked, and in another two there was suprapubic discomfort. The tumors were all intramural or subperitoneal, and quite large. Cystoscopy showed extravescial pressure and consequent distortion of the bladder wall in every case. One patient with a fat abdominal wall had been treated for six months by her physician for frequency and urgency of urination; her doctor did not suspect the presenee of a tumor, as she had no other symptoms. Cystoscopy alone was suffieient to establish the diagnosis; there was a very marked bulging and distortion of the posterior wall of the bladder, without any evidenee of cystitis.

The two patients with an extremely anteverted, almost immobilized uterus complained of frequency of urination only. They had both been operated upon for correecton of retroversion, and were victims of operative "technie," at the expense of restoration of function. I could not determine what special technie had been followed, however. An extremely anteverted fundus, which cannot move backward to any extent as the bladder fills, causes extravescial pressure, capillary stasis, and serves as a constant irritant to the bladder in the course of time. This point should be borne in mind by gynecologic operators. Immobilization of an anteverted uterus is just as bad as a mobilized retroverted organ.

The large ovarian eyst, pyosalpinx, and ectopie pregnaney also excited frequency of urination through extravescial pressure.

In the patient with varieose veins of the broad ligament cystoscopy showed the same sort of varicosities in the bladder wall. Frequency of urination promptly disappeared after the incidental retroversion and broad ligament varicosities were cured by operation.

One woman with Bartholinitis complained of urethral pain, but had no speeifie urethral infection. This symptom was due to the pressure of a huge abscess, exerted on the urethra.

The patient with chaneroids complained of burning on voiding, due to contact of the urine with the vulvar and perineal lesions.

It is interesting to note that ten patients had urinary symptoms for which no local cause could be found in either the pelvic organs or urinary tract. They were ascribed to the following extraneous causes:

Endocrine derangements	4
Neurasthenia	2
Neurosis	2
Circulatory hypertension	1
Menopause	1
Total	<u>10</u>

As is usually the case in disturbances of the internal secretory glands, there was definite indication of dysfunction of more than one

gland in three of the four cases. But it is significant that all exhibited several manifestations of hyperthyroidism. They all had increased frequency of urination, and three had impaired control.

One patient with neurasthenia had diurnal frequency; the other had urgency, without increased frequency. An obscure neurosis was blamed for two cases of nocturnal enuresis; one in a fourteen year old girl and one in an adult. These four patients were referred to a neurologist.

The woman with circulatory hypertension (systolic blood pressure 214) had diurnal and nocturnal frequency, both of which disappeared with the reduction of the abnormal pressure.

Similar symptoms occurring in another woman during her climacterium cleared up simultaneously with the hot flushes, sweats, and other menopausal manifestations, after the administration of ovarian and corpus luteum extracts.

CONCLUSIONS

While it is obvious that an exhaustive exposition of the several topics considered has not been attempted, and that the number of case records included in this study is not very large, I believe that sufficient evidence has been presented to justify the following conclusions:

1. A study of 600 consecutive private case records indicates that approximately 20 per cent of gynecologic patients will require a cystoscopic examination to establish a diagnosis.

2. About 15 per cent of gynecologic patients have some definite lesion of the urinary tract.

3. Many patients are deprived of prompt relief from symptoms because so many practitioners are willing to treat a woman for "cystitis," without actually demonstrating an inflammation of the bladder.

4. It is imperative for the gynecologist to have a working knowledge of cystoscopy.

5. All gynecologic patients should be catheterized on their first visit.

6. Valuable information can be obtained by the inspection of freshly catheterized urine.

7. A renal function test should be done before most elective gynecologic operations.

8. Pyelitis occurs frequently in women, and is often overlooked.

9. Fever is conspicuous by its absence in all cases of inflammation limited to the bladder.

10. In a small proportion of cases only urinary symptoms are caused by pelvic lesions, without coincident disease of the urinary tract.

11. Cases are encountered occasionally in which the urinary

symptoms are due to causes remote from the urinary and pelvic organs.

12. No urinary symptom, or symptom-complex, is pathognomonic of anything. The diagnosis rests almost entirely upon the objective evidence.

580 Park Avenue.

REPORT OF A CASE OF SOLID CARCINOMA OF THE OVARIES REACHING TO THE NAVEL, IN GIRL OF NINETEEN*

By ROBERT L. DICKINSON, M.D., NEW YORK

THE family history and general health excellent, nervous balance perfect, intelligence high and athletic development such that she carried on her horseback hurdle jumping up to the time of her first visit. No disturbance of periods, no pain or discomfort or sense of pressure, no weight-loss; regular bowel action. First intimation of trouble was in mid-August, when, after an automobile accident, brief distress was located low in right side of the abdomen with mild temperature two days.

First seen Sept. 22, 1922, all general tests normal, remarkable poise and vigor. Tumor, smooth and with feel of fibroid, rising to height of navel on the right side, laterally from right crest to line half way between navel and left crest, mass filling pelvis snugly and on pelvic floor; beneath, very nodular and hard, and here strongly suggestive of malignancy. Diagnosis, double ovarian cyst, multilocular; fibroid or malignancy possible.

Operation at Brooklyn Hospital, Sept. 27. A little bloody ascitic fluid, no adhesions, no peritoneal involvement. Mass springs from right pelvic wall with $\frac{3}{4}$ turn of pedicle. Pelvis so filled as to mould the tumor on sacrum and pubes. With gentlest handling removed very close to pelvic wall; also uterus, (save for tip of cervix) tubes and most of broad ligaments. Other ovary has small growth; lymph glands not affected. No evidence of being secondary to cancer of stomach, gall bladder or bowel. Tumors solid, nowhere cystic, nowhere softened, judged by appearance malignant. Veins of short pedicle very large. Appendix removed. See diagrams.

Smooth convalescence. Upper two figure-eight silkworms slow to loosen with a little pus about them.

The measurements of the larger tumor were 8 x 4 x 4 inches, the abdominal portion relatively smooth and hard as a fibroid, the intrapelvic portion nodular and suggestive of malignancy. On section the surface did not have the appearance or feel of a fibroid, but it was smooth and slippery; to the eye there was no reticulated structure and the color was yellowish pink and not the white pink of a fibroid. The diagram shows where there were two rather bright yellow spots of the prevailing firmness, one one-third inch and one one-half inch in diameter. There were no cystic areas and nothing suggesting normal ovary. The left ovary is $1\frac{1}{2}$ " long by 1" thick and carries a band of finely granular pink surface across its equator which to the naked eye is suggestive of sarcoma. On section the portion next the broad ligament appears merely edematous. The remainder looks like the large tumor. The uterus is normal in size and the tubes and broad ligament normal, except for a few peritoneal cysts.

Pathologists' Report (Dr. C. F. Coulter).—A large tumor mass, uniform in appearance, of a fawn color, firm and cartilaginous consistency, containing caseous

*Presented at a meeting of the New York Obstetrical Society, December 11, 1922.

areas one centimeter or more in diameter. The small tumor in the opposite ovary has the same general appearance on section. It has no caseous area.

There is an abundant, dense, fibrous stroma, supporting closely-set solid alveoli and narrow infiltrating strands of tumor cells. Occasional gland formation is seen. The cells are of epithelial type.

These findings were confirmed by Professor Archibald Murray and the specimen preserved in the Museum of Long Island College Hospital.

A further report by Dr. Francis C. Wood states that the sections "show diffuse, small cell carcinoma involving apparently all the tissue submitted, so that it is not possible to recognize any normal structures. The walls of the vessels in some portions of this material are already invaded by the cells of the neoplasm. The prognosis in any case must be extremely bad."

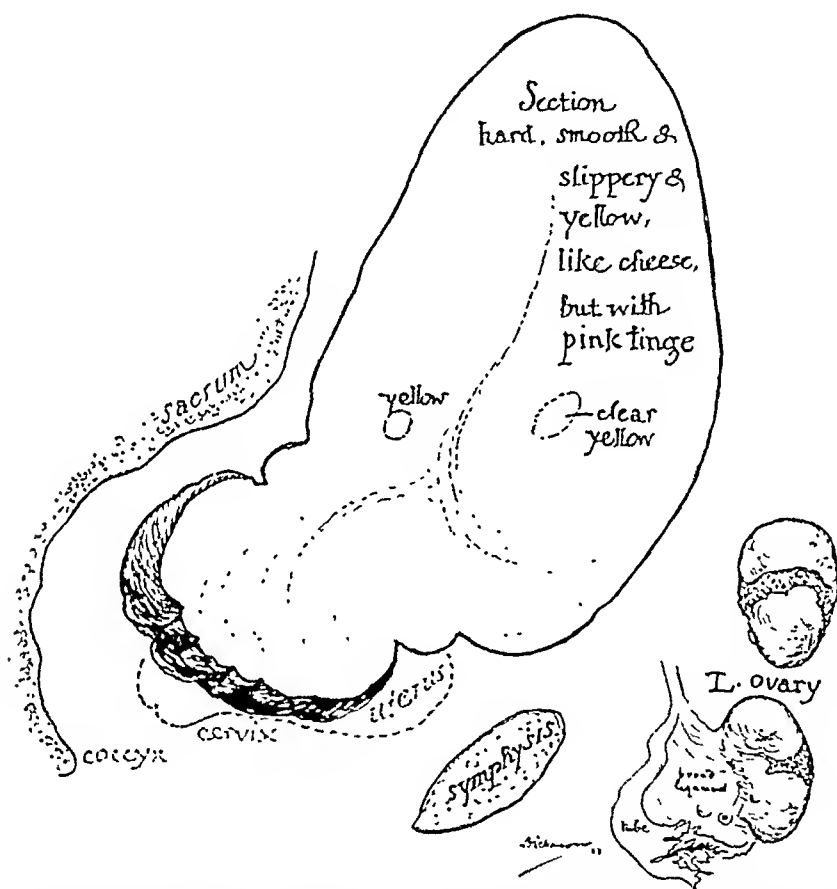


Fig. 1.—Section of solid carcinoma of ovary in girl of nineteen (19) reaching to the navel and nearly filling the pelvis. (2/5 life size.) The left ovary is shown at the right in profile and in face.

On her return to town two months later there was found attached to the right wall of the true pelvis just below the brim (where the top of the broad ligament had been, a hard mass one-half the size of a plum). A week later Dr. R. E. Herenden gave her a series of x-ray treatments. These did not cause the slightest physical or mental disturbance. This small mass disappeared. Eleven months after operation rectoabdominal examination shows that there is nothing in the pelvis save a barely recognizable, flexible string of scar leading upward each side from the little button of the vaginal portion of the cervix that was left. Liver, lungs and glands normal. Weight stationary. Fine general condition. No flushes or menopause disturbance.

At this writing, May 21, 1924, her general condition is the same and there are no local symptoms and no resistances in the lower abdomen.

59 EAST FIFTY-FOURTH STREET.

REPORT OF A CASE OF KRUKENBERG TUMOR*

BY ONSLOW A. GORDON, JR., M.D., BROOKLYN, N. Y.

THE most extensive review recently on the subject of Krukenberg tumor is the work of Major in 1918. A review of the literature up to that time showed fifty-five definite cases. Because of the infrequency of this type of tumor, I desire to record this case of bilateral ovarian Krukenberg tumor (carcinosarcoma mucocellulare ovarii bilaterae secundarium) from the service of Dr. F. C. Holden at Bellevue Hospital.

The patient, a negress thirty-nine years of age, was first admitted May 9, 1922, complaining of a gradually increasing amenorrhea and slight pain in the lower ab-



Fig. 1.—Showing the entire right ovary and a cross section of the left ovary.

domen. Her amenorrhea had been absolute for four months prior to admission. No mention was made of gastrointestinal symptoms at this time. Physical examination showed plainly palpable, hard, bilateral, pelvic masses. A preoperative diagnosis of bilateral ovarian fibromata was made.

A laparotomy was performed and the bilateral tumors which I will describe were easily removed. There was a moderate amount of clear fluid in the peritoneal cavity. A careful examination of the stomach and intestinal tract was not made at this time as the tumors were thought to be bilateral fibromata.

Macroscopic.—Bilateral ovarian tumors of approximately oval shape and equal size, each measuring approximately 16 centimeters in length by 11 centimeters

*Presented to the New York Obstetrical Society, December 11, 1923.

diameter, surface smooth, shows slight elevations and depressions. The tumors on section show a whitish gray solid structure which is largely hard with occasional softer, small cystic areas, none of them exceeding a few millimeters in size.

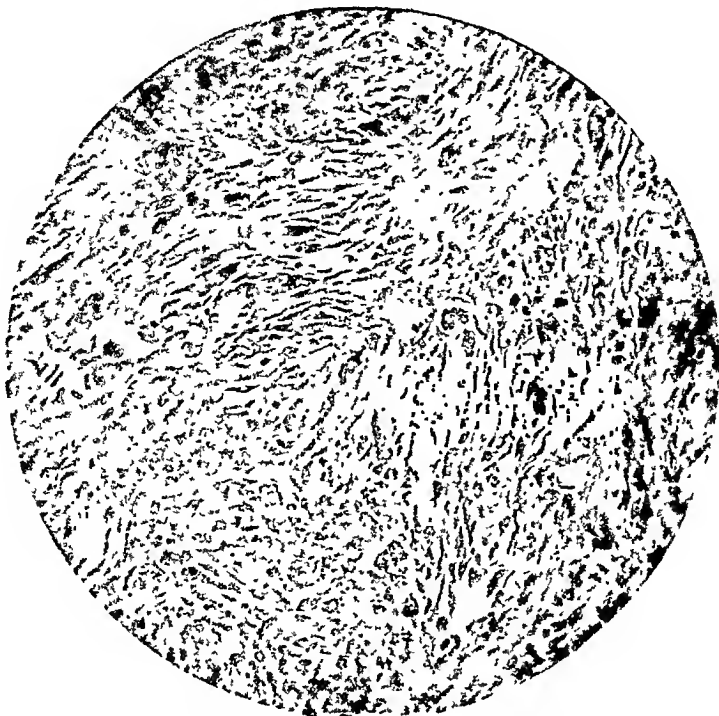


Fig. 2.—Showing the masses of spindle cells and so-called signet ring cells.



Fig. 3.—Showing whorls of spindle cells and a definite coil of epithelial cell type.

Microscopic.—Sections from the ovarian tumor show the entire ovarian tissue, with the exception of remnants of albunginea, replaced by a dense growth composed of masses of spindle cells with numerous mitotic nuclei. These spindle cells are

arranged in whorls, in certain portions, they contain large pale nuclei. In some places, outgrowing the number of spindle cells, one finds irregular and large hyperchromatic cells which fuse into giant cells or penetrate individually or in cell rows. Small circular lumina are lined with flattened cells of this type and near the edematous portion one finds large round cells with flat nuclei at the periphery, signet ring cells. A few wide tissue spaces are filled with coils of an epithelial cell type.

The patient made an uneventful recovery following her first operation and left the hospital one month after admission. At no time were definite gastrointestinal symptoms noted.

Three months after her first admission, she was readmitted complaining of nausea and vomiting and loss of weight. A second laparotomy, exploratory in character, was performed and a carcinoma of the pylorus was noted, thus establishing the primary location. The patient died one month after her second operation, but autopsy could not be obtained.

My case presents the usual clinical and pathologic features of this unusual type of tumor. The patient was thirty-nine years of age; Chapman found the average age to be thirty-six. The larger number of Krukenberg cases present symptoms of the primary location earlier than in our case. The tumor in the majority of the cases is secondary to the carcinoma of stomach or intestine and in 90 per cent of the cases is bilateral. All authenticated cases where the later course was known died of the disease.

71 HALSEY STREET.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

PROGRESS IN THE RELIEF OF STERILITY*

A CONSIDERATION OF DEVELOPMENTS IN THE PATHOLOGY, BACTERIOLOGY
AND SURGERY OF THE FEMALE GENITALIA WHICH LEAD
TO A MORE HOPEFUL PROGNOSIS

BY ARTHUR H. CURTIS, M.D., CHICAGO, ILL.

IT HAS long been accepted that at least 12 per cent of marriages are sterile and that gonorrheal infection is the predominating factor in the causation of sterility. Among the medical profession there has also been universal acceptance of the belief that surgical intervention, subsequent to infection, affords relief from sterility in only a small percentage of selected cases.

Recent advances in our knowledge and management of pelvic diseases have now materially changed the outlook. It therefore appears desirable to make a survey of the more important developments in this field which promise to improve the prognosis.

The limitations of our subject permit only passing consideration of sterility as it exists in the male. The husband's greatest influence in this trouble probably lies in the transmission of infection rather than in lack of the power to produce offspring. Aside from easily demonstrable congenital defects he is usually capable of procreation unless there has been a complicated gonorrheal infection or, more rarely, mumps or tuberculosis with associated involvement of the genitalia.

ABNORMAL PHYSIOLOGY IN RELATION TO STERILITY

As introductory to a consideration of physiologic disturbances in their bearing on sterility I wish to briefly emphasize two often unsuspected pathologic conditions which must be differentiated from physiologic disturbances. The first is gonorrhea, the second, mumps. As the result of study devoted to laboratory and clinical investigation of female pelvic infections, I am convinced that the gonococcus remains viable in the male genital tract much longer than genitourinary specialists are inclined to believe. Among the highest type of married women who complain of sterility we repeatedly find stigmata of former gonorrheal disease contracted from husbands who had been without symptoms for some years previous to marriage. It must

*From the Pathologic Laboratory and Gynecologic Service of St. Luke's Hospital. Annual Address to the Junior Students of Northwestern University Medical School.

ultimately be recognized that every man who has suffered from protracted gonorrheal infection requires painstaking eradication of residual foci, followed by an interval of years of rest before marriage is advisable.

Mumps infection is less important. There is, however, a considerable incidence of sterility among men who have had this disease with complicating scrotal involvement. Every young man who has suffered from mumps with orchitis should know that it is desirable to have a sperm test if matrimony is contemplated.

Turning now to purely physiologic problems in relation to sterility, the work of Reynolds and Macomber is of interest. They have arrived at particularly important conclusions concerning the relationship of mating to the bearing of young. Laboratory work leads them to the belief that apparently healthy individuals differ widely in reproductive power; a person low in the reproductive scale may succeed in obtaining offspring when mated with one possessed of high fertility, but when paired with an individual of average or deficient reproductive power there is much poorer prospect of pregnancy.

From a study of diets, Reynolds and Macomber found that calcium deficiency is an important cause of sterility and premature labor. Plenty of milk supplies this deficiency. If milk is objectionable, calcium lactate, gr. xx, t.i.d., may be employed. Lack of proper protein food, although important, is much less frequently responsible for sterility.

Conditions which influence the viability of spermatozoa in vaginal secretions have been extensively discussed. Little scientific information is available, however, aside from the fact that otherwise normal vaginal secretions are sometimes sufficiently acid to prevent conception. It is also demonstrable, clinically, that certain spermatozoa perish in secretions which are apparently normal in all respects. The administration of alkalis by mouth, e.g., sodium citrate, gr. xx, q.i.d., combats excessive vaginal acidity and, in practice, appears to exert a favorable influence in promoting pregnancy. Weakly alkaline low-pressure douches, occasionally administered before intercourse, may also be employed, but we must remember that douches are not entirely harmless. Within a year I have attended two patients who developed pelvic peritonitis subsequent to the use of high-pressure douches. Neither of these had previous external genital infection and in both instances examination revealed a patulous cervix: some of the douche fluid probably entered the open cervical canal and passed through the uterus and tubes directly into the peritoneal cavity.

Clinically interwoven with the problem of incompatibility of genital secretions is that of sterility ascribed to temperamental incompatibility of husband and wife. It is to be recognized that woman's receptiveness materially influences the character of the vaginal secretion and perhaps induces more frequent ovulation. But it is my belief that sterility among mismatched couples more commonly results from various other causes, such as avoidance of conjugal relations, secretly employed contraceptive measures and other kindred procedures, not excluding unsuspected trips to the abortionist.

Pregnancy among mammals naturally recurs at yearly intervals.

Adaptation to assure survival of the species has brought about greater frequency among certain lower animals; many human beings, on the contrary, have achieved a modification in the other direction. Although it is now normal for the average educated woman of this country to conceive somewhat irregularly, there remains a tendency to the establishment of a two-year or three-year cycle. Provided that husband and wife both give a history of good health, critical examination reveals no infection, and viable healthy spermatozoa are obtained, a diagnosis of relative sterility is warranted only after the expiration of a period of three years. Until these three years have elapsed treatment should be limited to simple measures.

It is worthy of note that sexual indulgence at infrequent intervals increases the likelihood of pregnancy. The most auspicious time is probably immediately following the cessation of menstruation. Most women then have greater desire and the cervical canal is widely open for entrance of spermatozoa. Also, it is known that ovulation occurs shortly after menstruation and viable spermatozoa should at this time have maximum prospects of reaching the ovum. It is worthy of note that spermatozoa have been recovered from women as much as ten days after coitus.

In the event of otherwise unaccountable sterility, insemination has been strongly advocated. We have met with failure in the few instances in which it has been attempted and have feared that this procedure introduces considerable danger of infection.

THE BODY OF THE UTERUS IN RELATION TO STERILITY

Chronic infections of the endometrium are now known to be uncommon and the old belief that "chronic endometritis" is a cause of sterility is now untenable. We have learned that curettage does not cure sterility, but is helpful mainly because it is accompanied by dilation of the cervix which relieves obstruction of the canal.

Some years ago we obtained evidence of considerable interest relative to the dangers of curettage. In certain cases normal scrapings were obtained from the uterus; then, several days thereafter, in the endometrium secured by hysterectomy, mixed cultures and endometritis were found. Clinical observation reveals a frequent incidence of sterility among otherwise healthy patients who have been curetted, after spontaneous abortion, for the purpose of "cleaning out" the uterus. It is apparently difficult to curette a bleeding uterus without danger of introducing low-grade infection. The essential pathology in such cases probably is an inflammation which encroaches upon the lumen of the interstitial portion of the fallopian tubes.

Uncomplicated displacements, although a predisposing cause of abortion, seem not to greatly interfere with conception. Fibroid tumors, on the contrary, often appear to mechanically interfere with conception as well as with the development of the fetus in case pregnancy does occur.

From the foregoing it is evident that treatment of the body of the uterus, aside from removal of tumors, seems to offer little help in the promotion of pregnancy. This statement does not, of course, cover the problems of abortion and premature labor; in these it is certain that uterine displacements, syphilis and focal infections play a large part.

THE CERVIX IN RELATION TO STERILITY

In consideration of the cervix one need scarcely mention that sterility is often relieved by thorough dilation, especially in the presence of marked congenital ante flexion.

Gross lesions of the cervix, notably those with associated purulent leucorrhea, play an important part in the prevention of conception. We believe that purulent leucorrhea has origin chiefly in small glands about the urethra and in hyperplastic hypersecreting infected glands of the cervix. Procedures directed toward cure of this condition often necessitate destruction or removal of all of the cervical mucosa up to the level of the internal os. At other times the only pathology may be a torn, everted, enlarged anterior lip with a constantly reforming mucous plug in the canal. A few moments' repair work may suffice to bring about relief.

Occasionally a congenitally short anterior vaginal wall tilts the cervix forward to such a degree that spermatozoa cannot enter. This condition is easily overlooked at the time of examination. When recognized, relaxation is obtained through a simple plastic operation. Anterior cervical displacements from other causes seldom produce sterility because they tend to be less constantly present, and, even if persistent, the supports of the cervix usually permit it to hang low enough for the entrance of spermatozoa.

During the last three years, I have been increasingly impressed by the helpfulness of cervical operations in bringing about relief from sterility, notably if these lesions are accompanied by purulent leucorrhea. Within six weeks we have delivered babies from two previously sterile women of this type and now have under observation a third patient who is three months pregnant. All of these women became pregnant within two months after leaving the hospital. It is obvious that treatment should not be attempted without first determining that the husband is healthy and that the fallopian tubes are patent.

THE FALLOPIAN TUBES IN RELATION TO STERILITY

(a) *Gonorrheal infection of the tubes* stands out as the one great cause of sterility and it is desirable that we consider certain recently noted characteristics of this disease which have a direct bearing upon sterility problems. In a large series of cases, cultivation of the entire tube, after thorough grinding, has revealed that infection rarely persists longer than two weeks subsequent to the disappearance of fever and leucocytosis. We assume, then, that gonorrheal salpingitis is a rather quickly self-limited disease. We have also been able to demonstrate that the body of the uterus does not harbor chronic gonorrheal infection. So-called "chronic gonorrheal salpingitis" therefore appears to be a reinfection of the tubes with fresh organisms from an outside source or from the chronically diseased lower genital tract.

Acting upon this laboratory evidence we have noted clinically that patients who have greatly thickened chronically diseased tubes of gonorrheal origin usually belong to the prostitute class or have freely cohabited with chronic carriers of infection. On the contrary, patients who are early isolated from the source of their disease usually bear a single attack of salpingitis without protracted clinical symptoms or severe pathologic results.

The mucosa of the tube is the part first invaded and ultimately most crippled, although severe gonorrheal infection tends to involve the entire thickness of the tube. Even after slight infection, healing is accompanied by microscopic adhesions between the folds of the mucous membrane. In more severe cases gland-like pockets of distorted mucosa also extend deeply into the wall of the tube. Therefore, although the fimbriae may remain open and the lumen patent, the ovum must travel along a difficult path provided with rough surfaces and pockets which interfere with fertilization and predispose to the development of tubal pregnancy.

A further point of pathologic interest is this: if operative relief is attempted in patients who have previously had salpingitis it is well to know that gonorrheal pelvic adhesions, even though numerous and dense, are always amenable to separation by blunt dissection.

(b) *Tubal infection after abortion.*—Sterility subsequent to abortion occurs very frequently. Most often there has been instrumental interruption of pregnancy. Less frequent, but perhaps more in need of consideration, is sterility which occurs in patients who have spontaneously aborted and thereafter have been curetted.

It has long been known that infection which complicates abortion travels through the cellular tissues rather than along the mucous membranes. The tubes, if diseased, present only part of a relatively diffuse process. We have learned that the tubes when involved, are usually attacked from without, the infection producing a perisalpingitis, with tendency to invasion of the mucosa last, if at all. From the viewpoint of relief of sterility this means that if other pathology is corrected the ovum has better prospects of free passage along the tube lumen than after gonorrheal disease of equal severity.

Other factors, however, make the prognosis less favorable after post-abortive infection. For example, streptococci are the invading organisms in most instances, and these bacteria, in contrast with the gonococcus, may remain viable in the tissues for many years after subsidence of the infection. Through cultivation of the ground tissues I have isolated the streptococcus even as long as eighteen years subsequent to the introduction of the disease.

Another unavoidable possibility is that of postabortive infection of the uterine wall in that region traversed by the fallopian tubes. Especially if the infected uterus has been curetted there is danger of interstitial tubal obstruction. Thanks to Rubin, we now possess a means of testing the patency of fallopian tubes. The technic of this procedure is easily mastered, the danger of introducing infection is slight, and the information thus obtained is of great value. It is also to be anticipated that transuterine inflation of the tubes will prove to be of therapeutic value in the relief of sterility.

c) *Relief of sterility after tubal disease.*—The trend of my clinical and laboratory work has led to a marked change in my views relative to two surgical problems. I have become a warm advocate of operation for relief of lower abdominal adhesions and am more favorably impressed by the feasibility of obtaining operative relief from sterility in carefully selected cases. These two subjects are closely related; firstly, because patients with sterility often suffer from pelvic adhesions, and secondly, because delicate surgical technic is necessary for relief of both.

Certain conditions and indications for attempted operative interference merit brief consideration:

The husband must be normal, without suspicion of residual infection.

The patient should be relatively free from purulent leucorrhea and cervical pathology.

The Rubin test should demonstrate occlusion of the fallopian tubes. We must not forget that reestablishment of tubal patency sometimes follows this test, and in selected cases the patient should be given ample time to become pregnant.

The etiology of the pathologic changes materially influences the prognosis. Sterility after mild postabortive infection is most favorable of all. In severe infections, however, the streptococcus has a long period of viability in the tissues, which makes us wary of early surgery. In such instances interference should be postponed for a minimum of two years.

The preoperative prognosis in patients who have had a brief attack of gonorrheal salpingitis is favorable. Repeated attacks make the outlook unfavorable. Likewise, if the husband had gleet or other persistent infection at the time of marriage there is prospect that the tubes are hopelessly crippled from recurrent infections, even though the patient has been relatively free from symptoms.

Inflammatory pelvic masses of sufficient size to be readily palpated make the prognosis distinctly unfavorable.

At operation, avoidance of hurry is imperative. It is usually possible to employ blunt dissection, with the scissors, along natural lines of cleavage. Rubber pads leave free surfaces whereas gauze packing produces fresh adhesions. Ligated tissues should be cut close to the point of ligature; we have demonstrated in animals that pedicles of considerable length become necrotic and adhere to adjacent surfaces. This plan of cutting close makes necessary the use of suture-ligatures whenever the pedicle is sufficiently large to permit the retraction of vessels. The value of absolute hemostasis and the helpfulness of omental transplants to cover raw surfaces require no comment.

Air distention of the fallopian tubes from within the abdomen at the time of operation is very helpful. The air is introduced from a Luer syringe held at the fimbriated extremity and is then milked along the tube in the direction of the uterus. In case of occlusion there is absence of a characteristic gurgle, always to be heard when there is free passage into the uterine cavity. This procedure makes possible a visual determination of the patency of grossly normal or doubtful tubes; strictures are localized and their extent determined; the interstitial portion of the tube becomes accessible, a factor of notable value after postabortive metritis; pressure upon the column of air irons out the mucosa, obliterating pockets between adjacent folds of the mucous membranes; distention of the tube also magnifies anatomic relationships, revealing congenital anomalies and membranous bands which interfere with normal function.

CONCLUSIONS

1. Provided that husband and wife both give a history of good health, critical examination reveals no infection, and viable healthy spermatozoa are obtained, a diagnosis of relative sterility is warranted only after the expiration of a period of three years. Until

these three years have elapsed treatment should be limited to simple measures.

2. Although sterility is sometimes ascribable to general ill health, improperly balanced diet, unsatisfactory mating, or abnormalities of genital secretions, it is probable that these various physiologic disturbances are the sole cause of sterility in only a small percentage of cases.

3. Gonorrheal infection and infection after abortion are the outstanding causes of sterility.

4. The gonococcus probably remains viable in the male genital tract much longer than has been believed; this is indicated by the frequent presence of stigmata of former gonorrheal disease among sterile married women whose husbands had been pronounced cured a considerable time previous to marriage.

5. Histologic and bacteriologic study of uteri removed several days after curettage showed that this procedure tends to introduce infection. Clinical observation reveals a frequent incidence of sterility among otherwise healthy patients who have been curetted, notably after abortion, for the purpose of "cleaning out" the uterus.

6. In the absence of other pathology, relief of abnormal conditions of the cervix is often followed by pregnancy; this is notably true if there is congenital obstruction of the canal or cervicitis with associated purulent leucorrhea.

7. Treatment of the body of the uterus seems to exert slight influence in the promotion of conception.

8. Operative interference, for relief of sterility resultant from tubal disease, yields much more satisfactory results than were formerly obtained; operation should be limited to selected cases which have been subjected to special preoperative study.

104 SOUTH MICHIGAN AVE.

Books Received

RADIUM REPORT OF THE MEMORIAL HOSPITAL IN NEW YORK. Second series 1923. Paul B. Hoeber, New York, 1924.

NATIONAL HEALTH SERIES: Personal Hygiene by Allan J. McLaughlin, assisted by James A. Tobey; Man and the Microbe by C. E. A. Winslow; Cancer by Francis C. Wood; The Baby's Health by Richard A. Bolt; Community Health by D. B. Armstrong; The Quest for Health by James A. Tobey; The Young Child's Health by Henry L. K. Shaw; Food for Health's Sake by Lucy H. Gillett; The Human Machine by W. H. Howell; Taking Care of your Heart by T. Stuart Hart. 1924. Funk & Wagnalls Co., New York.

SHORT PRACTICE OF GYNECOLOGY. By Henry Jellett. Consulting Gynaecologist late Master, Rotunda Hospital (Dublin); etc. Fifth Ed. With 318 illustrations (many in color) and 10 colored plates. 1924. J. & A. Churchill, London.

SCIENCE AND ART OF ANESTHESIA. By Colonel William Webster, Professor of Anesthesiology, University of Manitoba Medical School, Chief Anesthetist, Winnipeg General Hospital, etc. Illustrated. 1924. C. V. Mosby Company, St. Louis.

LA TUBERCULOSI GENITALE NELLA DONNA. Par professor Ernesto Pestalozza, direttore della clinica ostetrico-ginecologica della R. Università di Roma. 1924. Libreria di Scienze e Lettere, Roma.

UEBER EINGEBILDETE SCHWANGERSCHAFT. Von Dozent Dr. R. Hofstaetter, Wien. 1924. Urban und Schwarzenberg, Berlin und Wien.

HANDBUCH DER GESAMMTEN MEDIZINISCHEN ANWENDUNGEN DER ELEKRIZITAET. IN drei Baenden bearbeitet von zahlreichen Fachgelehrten des In- und Auslandes. Band iii, Lieferung 1: Das roentgentherapeutische Instrumentarium. Von Dr. Heinrich Martius, Privatdozent der Universitaets-Frauenklinik in Bonn a.Rh. 1922, Verlag von Werner Klinkhardt, Leipzig.

BIOLOGIE UND PATHOLOGIE DES WEIBES. Herausgegeben von Josef Halban, Wien, und Ludwig Seitz, Frankfurt a.M. Lieferungen 4, 5 und 6. 1924. Urban und Schwarzenberg, Berlin und Wien.

Item

At the Annual Meeting of the American Gynecological Society held at Hot Springs, Virginia, May 15, 1924, the following officers were elected for the ensuing year:

President, Dr. Howard C. Taylor, 32 W. 50th Street, New York City; *1st Vice-President*, Dr. Franklin S. Newell, 443 Beacon Street, Boston, Mass.; *2nd Vice-President*, Dr. Frederick J. Taussig, 3519 Washington Ave., St. Louis, Mo.; *Secretary*, Dr. Arthur H. Curtis, 104 S. Michigan Ave., Chicago, Ill.; *Treasurer*, Dr. Charles C. Norris, 22nd and Chestnut Sts., Philadelphia, Pa. Other Members of the Council: Dr. Walter William Chipman, Montreal, Canada; Dr. George Gray Ward, New York City; Dr. John A. Sampson, Albany, N. Y.; Dr. Barton Cooke Hirst, Philadelphia, Pa.; Dr. Edward A. Schumann, Philadelphia, Pa.; Dr. William S. Stone, New York City.

The American Journal of Obstetrics and Gynecology

VOL. VIII

ST. LOUIS, AUGUST, 1924

No. 2

Original Communications

ETIOLOGY OF CERTAIN CONGENITAL STRUCTURAL DEFECTS*

BY HALSEY J. BAGG, PH.D., NEW YORK CITY
Memorial Hospital and Cornell University Medical College

GENERAL CONSIDERATIONS

IT IS known that specific structural defects may be experimentally produced in developing embryos by various agents. The means employed, the disturbing factor or factors, are not so important as regards the subsequent morphologic changes in the embryo as is the exact developmental period at which the disturbance is produced. An experimental disturbance during the very early embryonic period is likely to result in various eye defects, cyclopia, etc., while an identical disturbance acting somewhat later will result in defective brain or branchial systems, and still later in malformation of the viscera. In other words, the same treatment may produce one or more characteristic defects depending on the so-called critical period of development when the treatment is given.

If fertilized eggs of a typical vertebrate, such as a fish, are brought into the laboratory, placed in dishes of water and kept in a crowded condition, the resulting lack of proper oxygenation and overproduction of carbon dioxide will result in the formation of various monsters. The same abnormalities may be brought about by lowering the temperature of the eggs, by treatment with various chemicals, salts of magnesium, alcohol, etc. It has been shown that double monsters and twins may be produced either by a decrease in the temperature of the developing eggs or by an insufficient supply of

*Read by invitation at the meeting of the New York Obstetrical Society, March 11, 1924.

oxygen. The developmental disturbances produced by any given set of factors acting at a definite embryonic period are to a considerable extent specific and predictable. We then see that various agents, either mainly chemical or physical in action, may produce under proper conditions one and the same type of developmental abnormality.

The experiments of Daresta¹ conducted over thirty years ago, initiated the study of these interesting conditions. More recently Stockard has surveyed the entire field and has analyzed the various factors involved. In his recent paper on "Developmental Rate and Structural

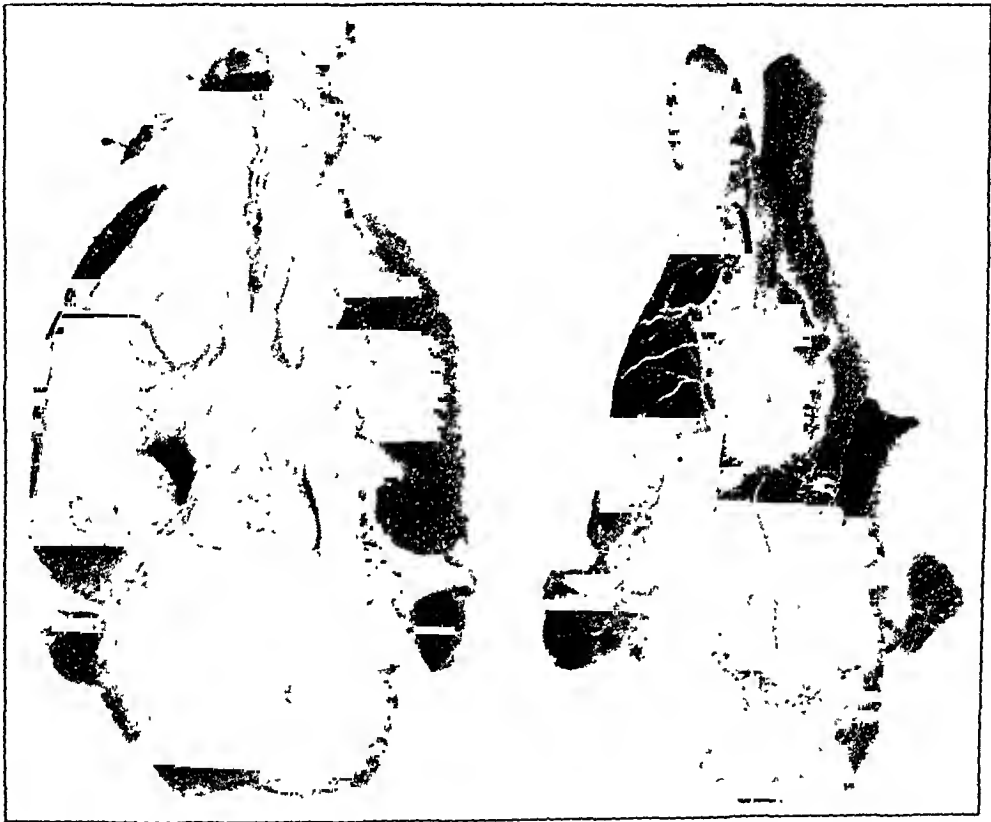


Fig. 1.—Ventral view of the brains of two adult rats. The one to the left is a control, showing well developed hemispheres and optic tracts. The brain at the right is from an animal irradiated *in utero* three days before birth and killed about a year later. Dose 1350 mg. hrs. of heavily filtered gamma-ray irradiation from radium emanation.

Expression,"² he has correlated many reactions. The experimentally induced embryonic abnormality apparently is due to an arrest in development at some critical growth period. The various disturbing agents have all tended to either temporarily slow or almost completely reduce the developmental rate. If the rate of development of an embryo is reduced for a limited period, then that part of the body which at that time normally would be developing the fastest is actually reduced and thereafter is never able to regain its normal rate in proper relation to other parts of the organism.

DEVELOPMENTAL ARRESTS IN MAMMALS

What is true for the ontogeny of fish and other lower vertebrates apparently holds for developmental arrests in the lower mammals. I have found in my studies on the effect of radium² and x-ray⁴ irradiation on developing rats and mice treated *in utero* that blindness and various arrests in the development of the brain and the gonads, etc., were constant features. Many of the abnormalities were not apparent until a considerable time after birth.

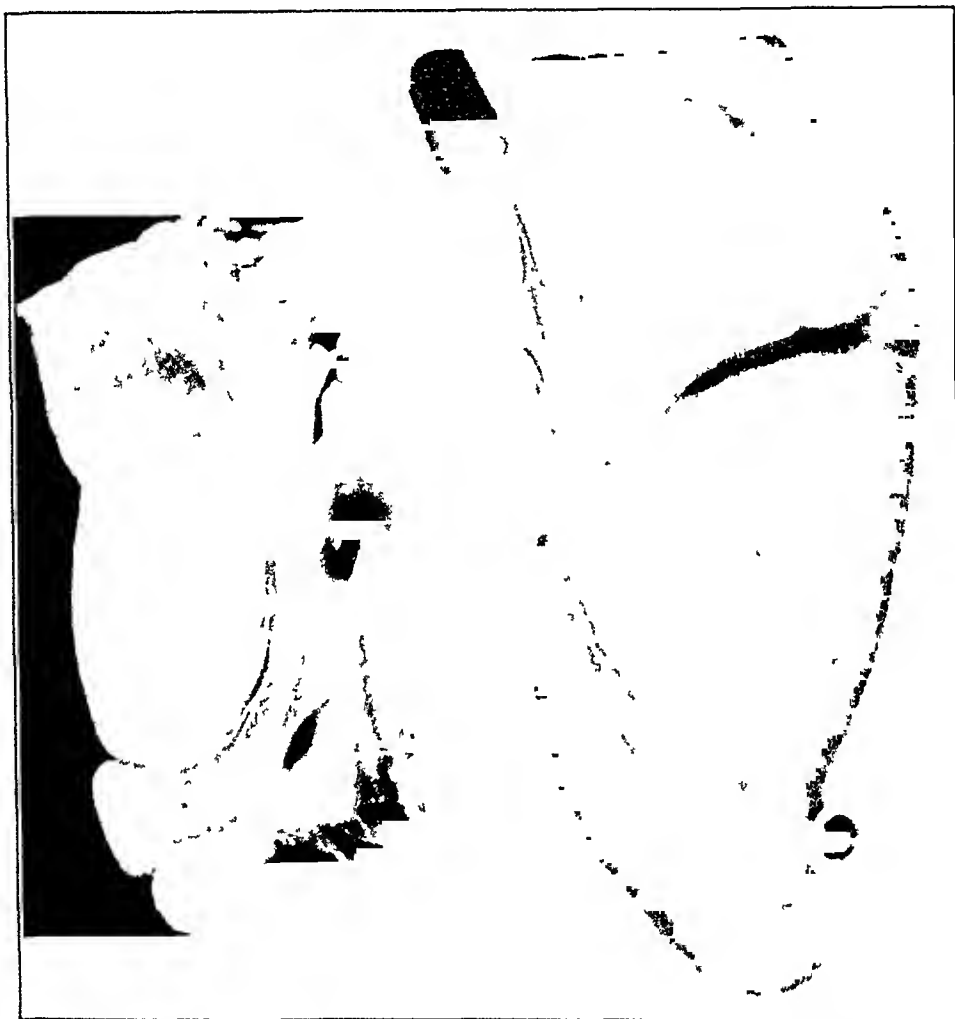


Fig. 2—The testis at the left shows a pronounced arrested development due to irradiation *in utero*. The testis at the right is a control from an animal of about the same age and weight. Dose the same as given in Fig. 1.

An example of arrested brain development is shown in Fig. 1. The illustration at the left is a ventral view of the brain of an adult rat with well developed hemispheres and optic tracts. The brain at the right was photographed at the same magnification and was taken from an animal irradiated *in utero* towards the end of pregnancy. The animals were about the same age when killed. The irradiated brain shows a marked reduction in the size of the hemispheres asso-

ciated with pronounced atrophy of the optic tracts. The arrested development of the testes of the irradiated animal is shown at the left of the illustration in Fig. 2 with a normal testis at the right for comparison.

Just a year ago, in conjunction with Dr. Harold Bailey, I had the opportunity to present before the Section of Obstetrics and Gynecology, at the Academy of Medicine, certain experimental and clinical data concerning the effects of irradiation on fetal development.⁵ It will not therefore be necessary to repeat here the evidence for and against the possibility that present day clinical irradiation may affect human development. To make our position clear, however, I would add the following from our conclusions which were drawn at that time: "It is questionable whether radium or x-ray irradiation should be used to destroy the ripe follicles, leaving the immature ones injured but capable of development. This statement is made entirely on the strength of the experimental work on the lower animals and we do not feel justified in considering any of the available clinical records as adding conclusive evidence in this regard. In the treatment of menorrhagia in the child-bearing period we believe that complete sterility is preferable to the possibility of a damaged germ plasma. Irradiation of the ovum during early pregnancy should never be permitted. Radiation in late pregnancy, while it may not produce gross abnormalities at birth, may hinder the growth and development of the child in later life."

Again in regard to the data from which the above conclusions were drawn, it is proper to state that there are several cases reported in the literature where apparently normal children have been born following exposure to irradiation, and a full presentation of the available records is given in the above-mentioned paper.

At the time the above report was made we very briefly mentioned some experiments that I had been conducting concerning the occurrence of hereditary abnormalities in mice following x-ray irradiation.* I wish now to mention very briefly the main results of that study which have been but recently obtained. This material is presented, not only to demonstrate the occurrence of hereditary abnormalities associated with irradiation, but to suggest the possibility of certain factors being related to their production.

HEREDITARY DEFECTS ASSOCIATED WITH X-RAY IRRADIATION

A group of mice from a well-known homozygous strain was divided by chance into two parts. In one group both male and nonpregnant female animals were irradiated for twelve seconds on each of five consecutive days with a light dose of unfiltered x-rays.** The animals

*Dr. C. C. Little was associated with me during the years 1920 to 1922, during which time the genetic tests were made.

**Target skin distance 12 inches; 10 milliamperes of current, 2½ inch spark gap.

were then mated. Those of the other groups were also mated and kept as a control. In the third generation of one of the irradiated lines an animal was found with a defective eye. Later many such animals were obtained. The defect has been found to be definitely inherited and in certain families occurs in 100 per cent of the offspring of defective parents. The abnormality behaves as a mendelian recessive, i.e., if in a mating one parent, either a male or female, is genetically abnormal for a certain eye defect and is mated with a perfectly normal animal, then approximately one-fourth of their grandchildren will reproduce the characteristic of their abnormal grandparent. The first generation individuals of such a cross have always been normal and the second generation has been obtained from them by *inter se* matings. Although the control animals have been subjected to exactly the same inbreeding as were those from irradiated parents no such hereditary abnormalities have been found in the examination of over 2000 individuals. Over 4500 abnormal animals have been examined. Other structural disturbances have been closely associated with the eye defect. Abnormality of the limbs, club feet, syndactylism and polydactylism have been most prominent. Recently I have noted the occurrence of various kidney abnormalities in this strain, from a partial to complete absence of one kidney to congenital absence of both.^{6, 7}

I have been interested in the etiology of developmental defects and it has thus been a unique advantage to have had for study a large number of animals with hereditary abnormalities. The examination *in utero* of many young from abnormal parents has led to the conclusion that such defects are mainly of the nature of arrested development. Stockard² has claimed "that all types of monsters not of hereditary origin are to be interpreted simply as developmental arrests." I would add that certain structural abnormalities of my experimental strains that are definitely inherited, apparently also are of the same nature, and the following data very briefly describe the evidence on which this statement is made.

EXPERIMENTAL RESULTS CONCERNING THE ETIOLOGY OF HEREDITARY DEFECTS

Nature of the Abnormalities.

1. *Eye Defects.*—The eyelids of young mice are tightly closed at birth and remain so for several days. Many of the abnormal animals have shown at birth an arrested development of the the eyelids over one or both eyes. In such cases the lens usually protrudes from the head and the anterior chamber of the eye is missing. Such animals always become blind in later life. When young from abnormal parents are examined *in utero* the pronounced frequency of localized blood vascular extravasations, especially in the head region, is a most striking characteristic, and is a feature not found in the control animals. The fetus at the right of Fig. 3, (it was removed from the uterus when about 8 mm. in length) shows a well marked

hemorrhage covering the left eye as well as another in the region of the left kidney.

2. *Foot Defects*.—Club feet are frequently found associated with the eye defects. Animals with abnormal limbs may or may not show at birth the presence of hemorrhagic lesions at the extremities, but several animals have been found with such conditions, which suggests that there is some common etiological factor, possibly a tendency to a defective blood vascular system that is associated with the production of all these abnormal structures. The animal at the left of Fig. 3 is a litter mate of the fetus described above and is of interest in showing a well-marked, heavy hemorrhagic lesion involving a considerable portion of the left hind foot. There is a middorsal and smaller left lumbar lesion as well. I believe that an embryonic foot lesion similar to the one illustrated in Fig. 3 may produce one or more structural defects in later life, but the following suggestions must be taken merely as suggestions and not as demonstrable facts. If the area of extravasation is slight and involves only the superficial cutaneous layers, then a partial or complete syndactylism may occur. Lesions involving the deeper muscular and tendon areas are likely to produce, by natural reparative processes initiated for their re-



Fig. 3.—These embryos were 8 mm. in length when killed in *utero*. Their parents both showed hereditary abnormalities. The animal at the right shows a well marked hemorrhage in the region of the left eye and another apparently older lesion in the left lumbar area. The animal at the left is of interest in showing, in addition to two lesions of the back, a well marked hemorrhage involving the left hind foot.

moval, more extreme alterations in the adult structures of the limbs. This may account for the relative frequency of club feet in the experimental strains. The radiograph in Fig. 4 shows the hind limbs of a male animal from the defective lines. The right limb at the left of the illustration is club-shaped and markedly flexed, but the abnormality is mainly of the soft parts of the foot, while the bones are all present although distorted in position. The other limb shows the presence of an extra toe. The tendency to abnormal limb production is very marked in some animals. In certain cases two, three, or even all the limbs of a single animal may be club-shaped.

3. *Visceral Disturbances*.—Animals from the defective eye and club foot strains have shown over seventy-five cases of congenital kidney abnormality. This condition has not been found in the control animals. The kidney may be from slightly, to partially, to completely missing on one side of the body. When the kidney abnormality is purposely accentuated in a given family by breeding from animals with such abnormality, then a certain number of their young will be found at birth with congenital absence of both kidneys. They live only for a day or two with

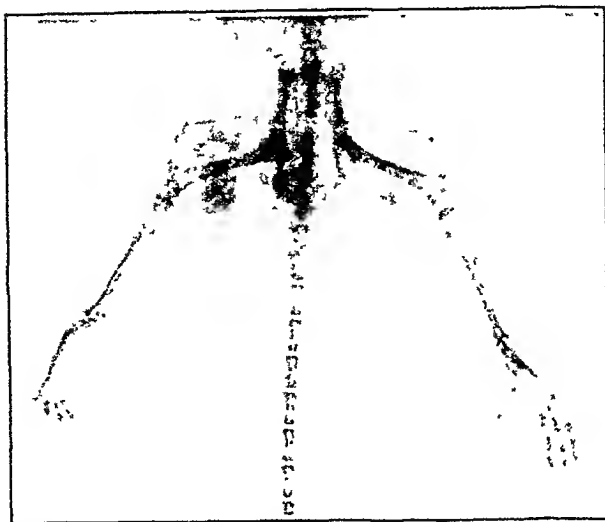


Fig. 4.—This radiograph shows the hind limbs of an animal with hereditary eye defects. One limb shows a marked club-foot condition and the other polydactyly.

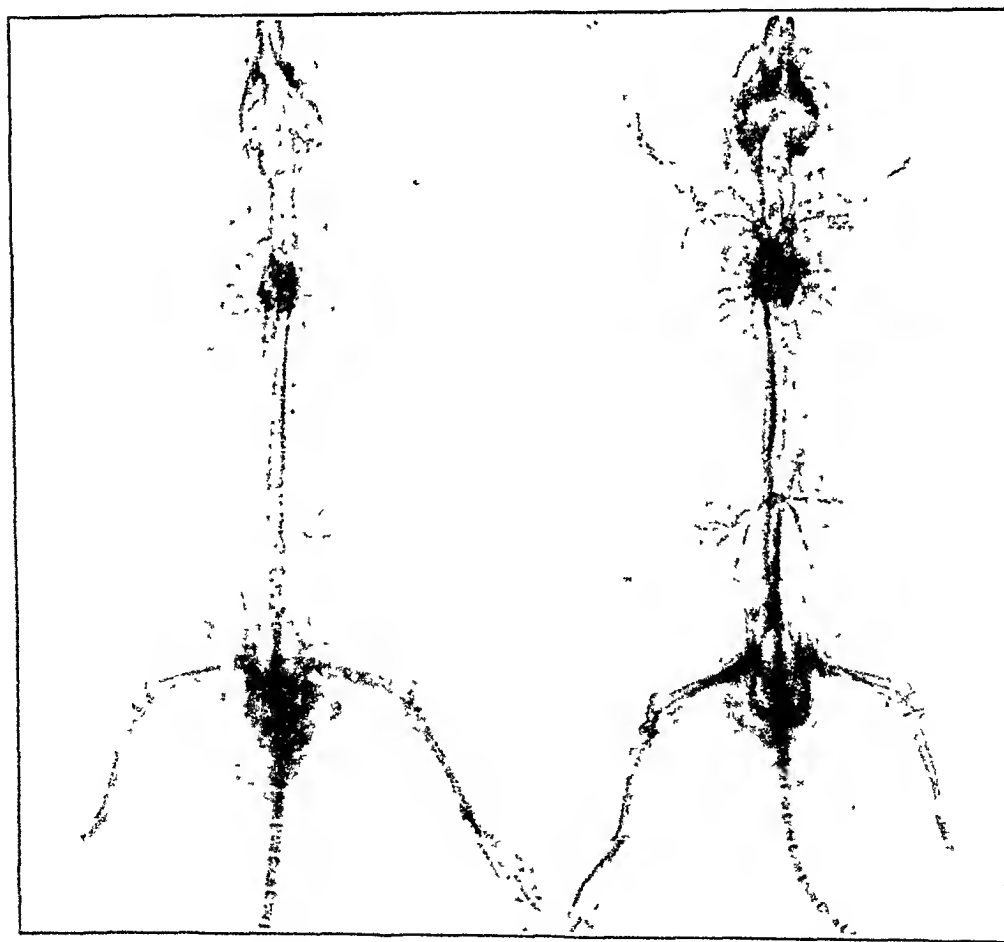


Fig. 5.—Radiographs of two animals with the arterial systems injected with an opaque solution to show the blood supply to the kidneys. At the left an animal is shown with complete congenital absence of the right kidney. The normal position of the kidneys is shown in the illustration at the right, but the animal in this case shows as well a club foot of the left hind limb.

this condition. The radiograph of Fig. 5 represents two animals with the arterial systems injected with an opaque solution. The animals were photographed from a ventral view so that the images are reversed in the illustration. The animal at the left shows the complete absence of the right kidney. The animal at the right shows the normal position of the two kidneys. This animal, however, has a club foot of the left hind limb. In a few instances actual hematoma and traces of hemorrhage have been seen in the kidney region of embryos examined *in utero* or just at birth, and the writer suggests that the blood vascular disturbance with an accompanying ar-

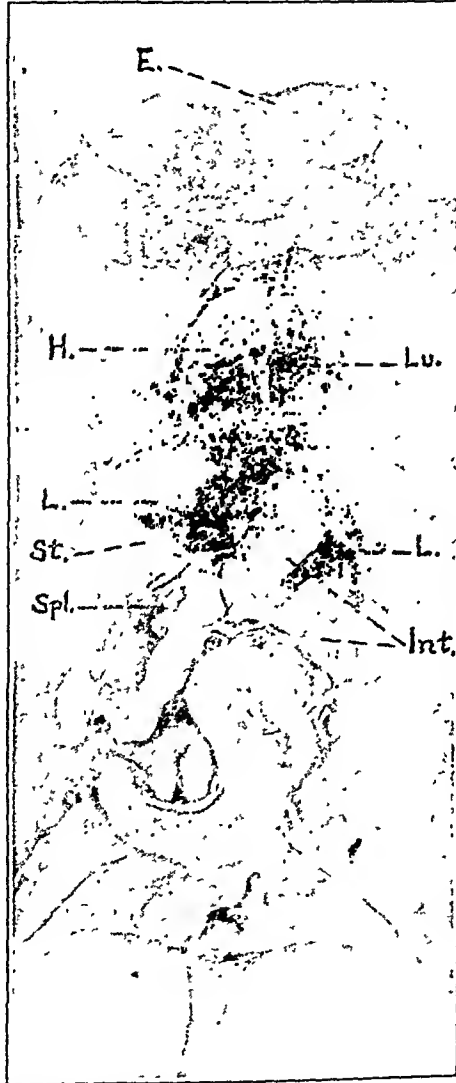


Fig. 6.—Situs inversus viscerum associated with hereditary eye defects. *E* indicates the complete absence of the right eye.

rest in development was possibly associated with the absence or malformation of the kidneys in these experimental animals.

Another visceral disturbance associated with hereditary eye abnormalities is *situs inversus viscerum*. Only a single individual has so far been observed. This abnormality is exceedingly rare in laboratory animals, and is of present interest because of the possibility that the same factor or factors that produced the hereditary defects in my experimental stock may have some relation in this instance to the transposition of the viscera. If there is some such causal relationship, the disturbance

must have occurred very early in fetal development. A ventral view of this animal is shown in Fig. 6. It was killed when full grown. The head has been drawn forward to show the complete absence of the right eye. The heart, liver, stomach, spleen and intestines are all shown in the transposed position.

4. *Association of Defects.*—Pedigree 1 of Chart I shows the sixth and seventh generations of one of the abnormal lines from the irradiated strains. It will be well

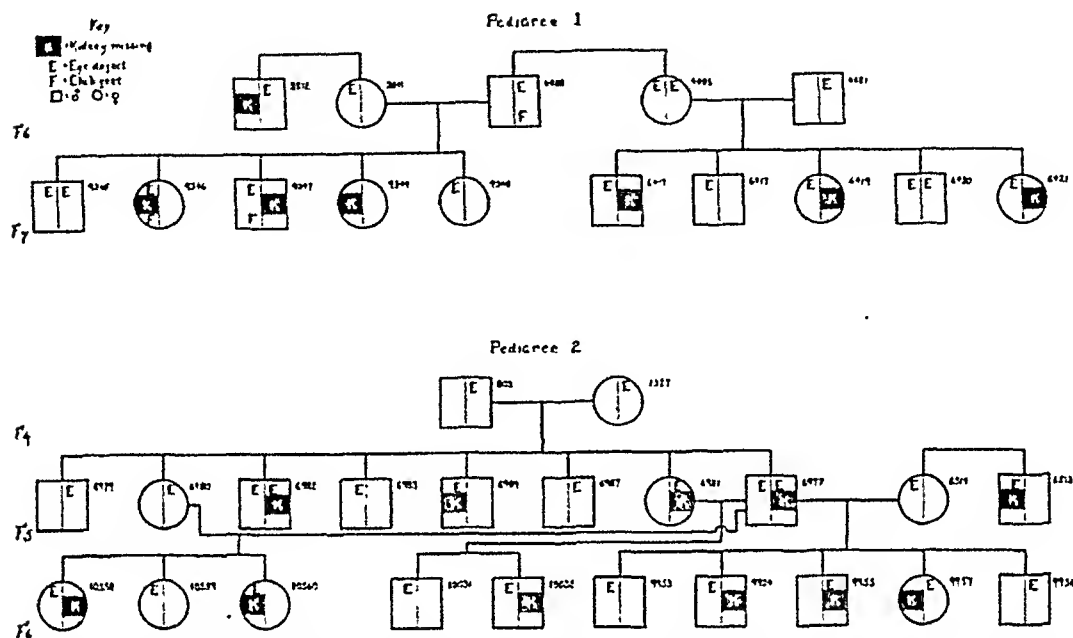


Chart I.—Two pedigrees are here shown from the experimental lines in which pronounced hereditary defects are present. Pedigree 1 gives only a small portion of the sixth and seventh generations and pedigree 2, a portion of the fourth to sixth generations. (For further reference see text.)

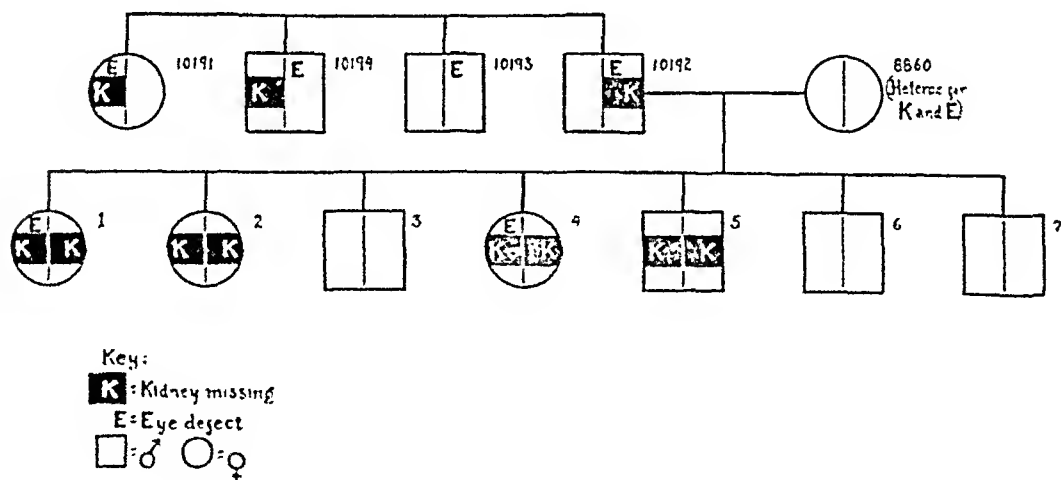


Chart II.—A single mating showing four animals with congenital absence of both kidneys.

to recall here that none of these animals were themselves irradiated. The irradiation was limited to the parents of the first generation. The squares represent males and the circles females. The vertical lines in the center of these symbols are shown to differentiate the right and left sides of the body. Consecutive pedigree numbers 9345, 9346, etc., indicate that the animals are litter mates. The letters E, F, and K represent eye, foot and kidney abnormalities respectively. It will thus be seen that male 9347 was a seventh generation animal, blind in the left eye, with a missing

right kidney and a left hind foot club-shaped. An examination of the two pedigrees of Chart I shows very convincingly the close association of the various defects I have described.

Chart II is of interest in showing a single litter, Nos. 1 to 7 inclusive, where one parent, male 10192, was blind in the right eye and had a missing kidney on the same side of the body. He was mated with female 8860 who was apparently normal but was genetically heterozygous for the eye and kidney defects. Four of their offspring, (Nos. 1, 2, 4 and 5), showed congenital absence of both kidneys. Nos. 1 and 2 were stillborn, but Nos. 4 and 5 were alive and active when killed about 24 hours after parturition.

DISCUSSION

One will note the prominence given in the experimental work above to the association of structural defects with arrested development coupled with blood vascular disturbances. A general tendency to abnormal structure associated with such disturbance (possibly poor blood vascular endothelium or other conditions of the blood vessels) is consistent with the marked tendency to the association of defects noted in my experimental animals.

The local area of blood vascular extravasation, if it occurs at a critical developmental period of any organ, may interfere with the normal differentiation processes, probably by depressing the rate of development as suggested by Stockard, and consequently that part of the body is never able to reach its normal degree of structure. The eyes are often affected in the animals of the experimental stock because for some unknown reason the blood vessels of the head (especially those in the eye region) are readily prone to extravasations during early intrauterine life.

Similarly blood vascular lesions in the region of the extremities of the limbs occur frequently and are associated with club feet and syndactylism. But entire organs may be modified, such as the kidneys, and their development partially or wholly suppressed, and certain data suggest that blood vascular disturbances are also operative here as well.

Several writers have recorded the presence of blood vascular extravasations in newborn children.^{8, 9, 10} Many of such lesions, especially in the head region, may be traced to birth injuries either due directly to instrumentation at delivery or to pelvic pressure and partial asphyxia and increased blood pressure during parturition. But similar hemorrhages have been found in children examined *in utero* (cesarean section) before the usual birth traumata have occurred,¹¹ and the presence of congenital nevi, etc., indicate that blood vascular disturbances in many instances have taken place some time in the prenatal period. Clinicians usually attribute club feet either to a faulty position in the uterus, or to a diseased condition of the cerebrospinal axis associated with paralysis and malformation of the affected limb. My study of the development of abnormal structure throws no light upon

either of these views. If the true club foot condition is of the nature of an arrested development, it would appear that the so-called abnormal position of the limb while in the uterus was a secondary feature of a more profound embryonic disturbance that occurred fairly early in prenatal life. In this regard, in addition to the theories stated above, I would call attention to the possibility that early prenatal localized blood vascular disturbances may be associated with disturbance in the development of the eye and even with the suppression of an entire visceral organ.

BIBLIOGRAPHY

- (1) *Darrest, C.*: Recherches sur la production artificielle des monstruosités, ed. 2, 1891, xvi, Paris. (2) *Stockard, C. R.*: Am. Jour. Anat., 1921, xxviii, No. 2, p. 115. (3) *Bagg, H. J.*: Amer. Jour. Anat., 1922, xxx, No. 1, p. 133. (4) *Bagg, H. J.*: Proc. Path. Soc. of Phila., 1923, N. S., xxv, p. 48. (5) *Bailey, H., and Bagg, H. J.*: AMER. JOUR. OBST. AND GYN., 1923, v, No. 5, p. 3. (6) *Bagg, H. J.*: Proc. Soc. Exp. Biol. and Med., 1923, xxi, p. 146. (7) *Bagg, H. J.*: Proc. Soc. Exp. Biol. and Med., 1924, xxi, p. 228. (8) *Little, W. J.*: Trans. Obst. Soc., 1861, London, iii, p. 293. (9) *Bailey, H.*: AMER. JOUR. OBST. AND GYN., 1920, i, No. 1, p. 1. (10) *Sharpe, W.*: Jour. Amer. Med. Assn., 1923, lxxxi, p. 620. (11) *Von Kuss, A. R.*: Diseases of the Newborn, 1920, London, p. 211.

(For discussion see page 229.)

NATURAL IMMUNITY IN THE NEWBORN

By LUTHER K. MUSSELMAN, M.D., NEW HAVEN, CONN.

PART II

IN a previous paper* it was shown that the maternal serum possesses a greater bactericidal action than the serum of the newborn. Likewise, the content of complement is greater in the maternal serum, although there is no evident parallel relationship between the two properties. As the sera of men, nonpregnant women, and women in the various months of pregnancy exhibit approximately the same bactericidal value as the sera of women at delivery, it is obvious that the sera of the newborn have a low bactericidal action. This paper will consider the various methods by which the normally low potency of the sera of the newborn may attain the adult value.

The marked difference in the bactericidal values of the sera of mother and newborn child is only temporary, as indicated by the results of the two cases examined later in the puerperium. In these cases (16 and 17) there was a marked increase in the bactericidal value of the sera of both infants, but the values of the maternal sera remained practically constant (Chart 3, see page 51, July issue).

As previously stated, natural passive immunity may be acquired either by placental interchange of preformed antibodies or by the transmission of antibodies through the colostrum and milk or by means

*Published in AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, July, 1924.

of both agencies. The results of the series of cases examined indicate that, if it exists, the placental transmission of preformed antibodies from mother to fetus plays a very small rôle; otherwise, the bactericidal values of the two sera would approximate each other. Before considering the rôle which colostrum and milk may play in the transfer of antibodies from mother to offspring, it will be of interest to consider the various antibodies which different workers have found in these fluids.

I. Agglutinins.—This antibody has been found in the colostrum or milk of women who had typhoid fever prior to conception, during pregnancy, or in the puerperium (Aehard and Bensaude,² Kasel and Mann,⁵³ Mossé and Daunic,⁷⁰ Löhr⁶⁵). Schumacher⁹⁵ found the titer of agglutinins in the milk of a woman who developed typhoid fever in the last month of pregnancy to be equal to that of the maternal serum. Sehenk⁹⁰ found agglutinins in the milk of 16 out of 28 parturient women, while v. Zubrzycki and Wolfsgruber¹⁰⁰ found both hemolytic and bacterial agglutinins in milk. The latter investigators believed that the content of agglutinins varied, since a greater amount of normal agglutinins was present in the specimens obtained on the first day after delivery than later in the puerperium. They showed that the hemagglutinin content of milk from primiparous women was higher and persisted longer than that of the milk of multiparous women. Hemagglutinins have been found in the milk of animals (Kraus,⁵⁷ Schumacher,⁹² Reymann⁸⁰). Little and Orentt⁶⁴ found a higher titer of agglutinins for *B. abortus* in colostrum than in the blood serum of the cow.

II. Opsonins.—v. Eisler and Sohma³² found the content of opsonin in the milk of immunized animals to be very high, when contrasted with the content of opsonin in the milk of normal animals. Tunnicliff¹⁰¹ found opsonin in normal colostrum and milk, but the values were less than those of the maternal serum.

III. Cytolysins.—(A) *Bacteriolysins.*—Moro⁶⁷ was unable to demonstrate any bactericidal property in either human or cows' milk. On the other hand, Sehenk⁹⁰ believed that human milk possessed a bactericidal action, but to demonstrate this, from 1 to 2 c.c. of milk was necessary. No bactericidal action was observed against any organism other than *B. typhosus*. The milk did not cause a complete destruction of the bacillus as the blood serum did, but seemed only to inhibit its growth. v. Fellenberg and Döll³⁵ believed that normal bacteriolysins were not transmitted to the infant through the milk.

(B) *Hemolysins.*—Bertino⁹ showed that rabbits which were immunized before conception failed to transmit hemolysin to their young through the milk. Famulener³⁴ found that if goats were immunized during pregnancy, the titer of the colostrum might often be higher than that of the blood serum; that the hemolysin disappeared rapidly from the milk; that the immunization of the mother after the birth of the young did not result in any transfer of this antibody to the suckling kids; and that a high degree of immunization probably was necessary before the antibody would appear in the milk. Howell and Eby⁴⁹ believed, in view of the diminished value of the maternal rabbit serum after delivery, that the antibodies were given out in the colostrum and milk, and suggested that this might be "a possible cause for postpartum infections." Wegelius¹⁰⁵ was unable to find any transmission of antihemolysins in milk.

IV. Complement.—Pfaundler and Moro⁷⁵ found a substance in milk which acted like complement in that it caused hemolysis, while Kopf,⁵⁶ using their method, concluded that milk did not possess any complement. Bauer and Sassenhagen⁶ believed that complement was present only in cows' milk in cases where there was a

mastitis, while the latter investigator⁵⁷ concluded subsequently that complement was present in the colostrum of cows and goats, but disappeared as lactation developed. With one exception Lane-Claypon⁶² found complement in specimens of cows' milk. Kolff and Noeggerath⁵⁵ claimed that human colostrum and milk contained no appreciable amount of hemolytic complement and no bactericidal complement. Hewlett and Revis⁵⁶ found a complement-like substance in colostrum and milk, but they were unwilling to consider it as true complement.

Obviously, there are the same differences of opinion regarding the transfer of antibodies in the milk, as are held regarding the placental interchange of antibodies. It may be that one species of animal will transmit both natural and acquired antibodies through the colostrum and milk, while another species will not. It does not necessarily follow because animals transmit antibodies to their offspring in the milk that a similar transfer takes place in man.

In view of the conflicting results in reference to the content of pre-formed antibodies in colostrum and milk, it was desirable to test the bactericidal action of these fluids.

I. The Determination of the Bactericidal Action of Human Colostrum and Milk

(A) Technique:

(a) *Method of securing and preparing specimens.*—Colostrum was obtained by a breast pump from four mothers at intervals varying from 24 to 72 hours after delivery, while milk was obtained from two mothers on the fourth and fifth days postpartum. The specimens of colostrum were passed through a Mandler filter. As the whole milk would not pass through the filter, it was centrifugalized, the fat layer removed, and the remainder subjected to filtration. Subsequent tests showed the filtrates of both colostrum and milk to be free of bacteria.

(b) *Method of performing the test.*—The bactericidal action of the four specimens of colostrum and of the two specimens of milk were carried out in the manner outlined under the determination of the bactericidal action of the sera of mother and newborn.

In view of the fact that the colostrum and milk were subjected to filtration, the question may be raised whether this procedure had not removed, either by filtration or absorption, the antibodies that might have been present. To eliminate this possible factor, three specimens of colostrum were tested in the following manner:

The specimens, as obtained, were mixed with equal parts of culture dilutions, the ends of the capillary looped pipettes were sealed, and placed in the water-bath at 37°C. for three hours. Upon removing them, the pipettes were inserted in a 10 per cent solution of carbolic acid for 20 minutes; the ends were then dried in sterile gauze and broken. The contents were plated out on Endo media, and at the end of 48 hours, colony counts were made, thus making it possible to differentiate *B. typhosus* from any contaminating organisms which might be present.

(B) Abstract of cases (Tables I, II and III)

(See pages 54 and 58, July issue.)

(a) Colostrum

Case 19

Case 20

—See Chart 4 (page 57, July issue)

Case 21

Case 22

(b) Milk

Case 18

—See Chart 4

Case 23

TABLE III

CASE	GRAVIDA	DURATION OF LABOR	DELIVERY	ANESTHETIC	CHILD SEX	BIRTHWEIGHT	WEIGHT ON DISCHARGE	REMARKS
		hours				gm.	gm.	
37	5	6	Spontaneous	Lt. chloroform	F	2800	2835	Thyroid-ectomy in 1912
38	1	8½	"	"	F	3415	3480	
39	2	7½	"	"	F	3755	3800	

Case 15.—The specimen of colostrum was obtained on the second day post-partum. The mixtures of colostrum and various culture dilutions were plated out on Endo media. Colony counts showed 75 colonies of *B. typhosus* in the culture dilution of $\frac{1}{2,621,440}$, while there were 40 colonies in the culture dilution of $\frac{1}{5,242,880}$.

Case 37.—The specimen of colostrum was obtained on the second day post-partum. The mixtures of colostrum and various culture dilutions were plated out on Endo media. Colony counts showed 47 colonies of *B. typhosus* in the culture dilution of $\frac{1}{2,621,440}$, while there were 20 colonies in the culture dilution $\frac{1}{5,242,880}$.

Case 38.—The specimen of colostrum was obtained on the third day post-partum. The mixtures of colostrum and various culture dilutions were plated out on Endo media. Colony counts showed 40 colonies of *B. typhosus* in the culture dilution of $\frac{1}{2,621,440}$, and in the culture dilution of $\frac{1}{5,242,880}$ there were 25 colonies.

C. Summary of results.—One specimen of colostrum showed permanent inhibition of bacterial growth in the culture dilution of $\frac{1}{1,310,720}$, one in the culture dilution of $\frac{1}{5,242,880}$, one in the culture dilution of $\frac{1}{20,971,520}$, and one exhibited this property in the culture dilution of $\frac{1}{82,886,080}$. The two specimens of milk failed to show inhibition of bacterial growth even in the culture dilution of $\frac{1}{83,886,080}$. The specimens of colostrum which were not passed through the Mandler filter showed from 20 to 40 colonies of *B. typhosus* in the culture dilution of $\frac{1}{5,242,880}$. It would appear that colostrum and milk have little if any bactericidal action for *B. typhosus*. Possibly the results which were obtained in the high dilutions are an expression of bacteriostatic action of the diluted culture, rather than a true bactericidal effect.

The results of the bactericidal action of colostrum and milk indicate that they do not play an important rôle in transferring normal antibodies from mother to offspring. Permanent inhibition of bacterial growth was shown by the colostrum only in culture dilutions from 13 to 20 times greater than those in which the maternal sera were effective.

II. Complement Titrations upon Human Colostrum and Milk

The evidence indicates that the low bactericidal value of the serum of the newborn is not due solely to a lack of complement, and that as colostrum and milk have little or no bactericidal action, their ingestion is not responsible directly for an increase in the bactericidal value of the serum of the infant. In view of the fact that colostrum and milk might contain complementing activating substances, complement titrations were made on various specimens.

A. Technic. (a) Method.—The same method was followed as that outlined under complement titrations on sera of mother and newborn. The colostrum and milk were not diluted for the titrations. As the resulting mixtures were not clear, it was necessary to centrifugalize the tubes and sediment the cells, to see if any hemolysis was produced. As no hemolysis was observed, the results indicate that the amount of complement in the specimens was either very slight, or was absent. In order to detect minimal amounts of complement in the colostrum or milk, titrations were made in which colostrum and milk were added in varying amounts to a hemolytic system in which there was a sublytic quantity of guinea pig complement. If the colostrum or milk contained a very small amount of complement, they should intensify the action of the sublytic quantity of guinea pig complement and produce hemolysis.

B. Experimental findings.—

CASE 11.—The specimen of colostrum was obtained on the second day postpartum.

TUBE	AMBOC. 1 unit	CELLS 2.5%	COLOSTRUM	SALINE	HEMOLYSIS
1	0.4 c.c.	0.5 c.c.	0.1 c.c.	1.5 c.c.	0
2	0.4	0.5	0.2	1.4	0
3	0.4	0.5	0.4	1.2	0
4	0.4	0.5	0.6	1.0	0
5	...	0.5	0.6	1.4	0

CASE 37.—The specimen of colostrum was obtained on the second day postpartum.

TUBE	AMBOC. 1 unit	CELLS 2.5%	COLOSTRUM	SALINE	HEMOLYSIS
1	0.4 c.c.	0.5 c.c.	0.1 c.c.	1.5 c.c.	0
2	0.4	0.5	0.2	1.4	0
3	0.4	0.5	0.4	1.2	0
4	0.4	0.5	0.6	1.0	0
5	...	0.5	0.6	1.4	0

Titration with the addition of a sublytic quantity of guinea pig complement.

TUBE	AMBOC. 1 unit	COMPLEMENT 1 unit = 0.15 c.c.	CELLS 2.5%	COLOSTRUM	SALINE	HEMOLYSIS
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	0.1 c.c.	1.4 c.c.	+
2	0.4	0.1	0.5	0.2	1.3	0
3	0.4	0.1	0.5	0.4	1.1	0
4	0.4	0.1	0.5	0.6	0.9	0
5	0.4	0.1	0.5	0.8	0.7	0
6	0.4	0.1	0.5	...	1.5	+++

CASE 39.—The specimen of colostrum was obtained on the third day postpartum.

TUBE	AMBOC. 1 unit	CELLS 2.5%	COLOSTRUM	SALINE	HEMOLYSIS
1	0.4 c.c.	0.5 c.c.	0.1 c.c.	1.5 c.c.	0
2	0.4	0.5	0.2	1.4	0
3	0.4	0.5	0.4	1.2	0
4	0.4	0.5	0.6	1.0	0
5	...	0.5	0.6	1.4	0

Titration of colostrum with the addition of a sublytic quantity of guinea pig complement.

TUBE	AMBOC. 1 unit	COMPLEMENT 1 unit = 0.15 c.c.	CELLS 2.5%	COLOSTRUM	SALINE	HEMOLYSIS
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	0.1 c.c.	1.4 c.c.	+
2	0.4	0.1	0.5	0.2	1.3	0
3	0.4	0.1	0.5	0.4	1.1	0
4	0.4	0.1	0.5	0.6	0.9	0
5	0.4	0.1	0.5	0.8	0.7	0
6	0.4	0.1	0.5	...	1.5	++

CASE 15.—The specimen of colostrum was obtained on the third day postpartum.

TUBE	AMBOC. 1 unit	COMPLEMENT 1 unit = 0.15 c.c.	CELLS 2.5%	COLOSTRUM	SALINE	HEMOLYSIS
1	0.4 c.c.	0.08 c.c.	0.5 c.c.	0.1 c.c.	1.42 c.c.	+
2	0.4	0.08	0.5	0.2	1.32	+
3	0.4	0.08	0.5	0.3	1.22	0
4	0.4	0.08	0.5	0.4	1.12	0
5	...	...	0.5	0.4	1.6	0
6	0.4	0.08	0.5	...	1.52	+++

CASE 8.—The specimen of milk was obtained on the tenth day postpartum.

TUBE	AMBOC. 1 unit	COMPLEMENT 1 unit = 0.15 c.c.	CELLS 2.5%	MILK	SALINE	HEMOLYSIS
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	0.1 c.c.	1.4 c.c.	0
2	0.4	0.1	0.5	0.2	1.3	0
3	0.4	0.1	0.5	0.4	1.1	0
4	0.4	0.1	0.5	0.6	0.9	0
5	0.4	0.1	0.5	0.8	0.7	0
6	0.4	0.1	0.5	...	1.5	++

CASE 15.—The specimen of milk was obtained on the tenth day postpartum.

TUBE	AMBOC. 1 unit	COMPLEMENT 1 unit = 0.15 c.c.	CELLS 2.5%	MILK	SALINE	HEMOLYSIS
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	0.1 c.c.	1.4 c.c.	0
2	0.4	0.1	0.5	0.2	1.3	0
3	0.4	0.1	0.5	0.3	1.2	0
4	0.4	0.1	0.5	0.4	1.1	0
5	0.4	0.1	0.5	...	1.5	+++

CASE 39.—The specimen of milk was obtained on the tenth day postpartum.

TUBE	AMBOC. 1 unit	COMPLEMENT 1 unit = 0.15 c.c.	CELLS 2.5%	MILK	SALINE	HEMOLYSIS
1	0.4 c.c.	0.1 c.c.	0.5 c.c.	0.1 c.c.	1.4 c.c.	0
2	0.4	0.1	0.5	0.2	1.3	0
3	0.4	0.1	0.5	0.4	1.1	0
4	0.4	0.1	0.5	0.6	0.9	0
5	0.4	0.1	0.5	0.8	0.7	0
6	0.4	0.1	0.5	...	1.5	+++

C. Summary of results.—Three specimens of colostrum failed to cause hemolysis when mixed with a unit of amboceptor and red blood cells. Nor was hemolysis observed with three specimens of colostrum and three specimens of milk in similar mixtures to which a sublytic quantity of guinea pig complement was added, although this quantity of complement was capable of causing partial hemolysis in the absence of colostrum and milk. In some instances, very small amounts of

colostrum and milk failed to inhibit hemolysis completely. These results indicate that colostrum and milk contain an anticomplementary substance which is present in a quantity sufficient to mask the action of any complement that might be present in these fluids.

III. Inactivation of the Serum, Colostrum and Milk with Experiments to Determine if the Bactericidal Action Depends upon a Thermolabile or a Thermostabile Antibody.

A. Technic. (a) *Method of securing and preparing the specimens.*—The blood serum used was a portion of that secured for the bactericidal tests. The colostrum and milk were passed through the Mandler filter. The serum of the rabbits was obtained directly from the heart. By heating in the water-bath at 56°C. for thirty minutes, the specimens were inactivated.

(b) *Method of performing the test.*—The same procedure was used as that previously outlined.

B. Experimental findings.—(See chart 5, page 59, July issue.)

C. Summary of results.—The addition of native serum to the inactivated sera of mother and infant resulted in an increase of the bactericidal values of both sera, but the values were not equal. When native colostrum or milk was added in equal parts to native serum, a lowering of the bactericidal value of the serum resulted. When native colostrum or milk was added in equal parts to inactivated serum there was, except in one case, a decrease in the bactericidal value of the serum. When inactivated colostrum or milk was added to inactivated serum, no end point of bactericidal action was obtained. These results indicate that the bactericidal action of the serum is dependent upon a thermostabile antibody whose activity is increased by the presence of complement.

DISCUSSION

While it is recognized that natural species and racial immunity is inherited, there is no conclusive evidence that this is true for natural individual immunity. On the other hand, it must be admitted that under certain circumstances susceptibility may be inherited, as indicated by the work of Cooke and Vander Veer,²¹ relative to the inheritance of protein idiosyncrasy.

It is of advantage to consider the various possible ways in which an infant might develop an immunity. These possibilities may be arranged as follows: (1) true inheritance through germ plasm; (2) placental interchange of preformed antibodies, of an activating substance or of an antigen; (3) ingestion of colostrum and milk in which there may be preformed antibodies, activating substance or an antigen; (4) development of antibodies by the infant itself, independent of the mother (growth mechanism).

The experimental work of Ehrlich with mice, which were immunized against abrin, ricin and robin, demonstrated that there is no actual inheritance of immunity. Immunized males were unable to transmit any immunity to their offspring. The immunity in the offspring was regarded as passive immunity through intrauterine transfer of antibodies and through suckling.

The results of the determinations of the bactericidal values of the

sera of mother and newborn indicate clearly that there is not a free placental interchange of antibodies from mother to fetus. It appears that the antibody possesses a structure which will not permit its diffusion through the placental barrier, or its selective absorption.

While most investigators believe the action of the placental partition can be explained by the mechanistic hypothesis, there are some findings which support the vitalistic theory. Edelstein and Ylppö²⁵ found the sodium content of the newborn blood to be greater than the maternal; their results with potassium varied, but in the majority of instances the newborn was higher than the maternal. They believed the mechanism of the placenta could be explained on the basis of a vital cellular activity. Seherenziss⁹¹ had previously called attention to the variance in sodium content of maternal and fetal blood, but he found that the fetal blood was poorer in potassium, and that the chlorides which were not bound with sodium and potassium were considerably less in the fetal blood. Veit¹⁰³ found differences in the freezing point of the maternal and newborn sera, but equal values were shown by Krönig and Füh.⁶⁰

In reference to the nitrogenous constituents of maternal and newborn blood, Morse⁶⁹ has shown that the newborn has a higher content of amino-acid nitrogen than the maternal; Slemons and Bogert⁹⁵ found practically the same value of urea in the blood of mother and newborn; equal values for creatin and creatinin were found by Hunter and Campbell⁵¹ and by Plass.⁷⁶ Morriss⁶⁸ found that in 19 cases the maternal blood was richer in blood sugar than the blood of the newborn, while in 5 cases the values were equal. Slemons⁹⁶ found higher values for fat, cholesterol and lecithin in the maternal blood, and concluded that the fetus synthesized fat from the glucose which the mother furnished. Howe and Givens⁴⁷ concluded that diffusion offered the most reasonable explanation for the passage of nutrient material and waste products through the placenta.

Howe⁴⁸ showed that newborn calves are lacking in euglobulin, which is a fraction of serum globulin with which antibodies are believed to be associated. Lewis and Wells⁶² and later Boyd¹² found that a newborn infant was likewise lacking in euglobulin. But they concluded that the offspring when fed colostrum showed a higher value of euglobulin than those artificially fed, for colostrum is rich in euglobulin, the only blood protein secreted in colostrum.

In 1908, Pfaundler⁷⁴ reviewed the experimental data on the transmission of both natural and induced antibodies from mother to child. In a few cases, induced antibodies were found to have passed through the placenta. He concluded that it was not a physiologic function of the placenta to transmit antibodies from mother to child and, as the maternal serum is always of a higher value than that of the newborn,

it seems quite likely that these views are correct. On the other hand, it is impossible to rule out the placental interchange so long as bactericidal action is demonstrated by the serum of the newborn. It is conceivable that inorganic salts would diffuse through the placenta, while some organic constituents would not. However, as we believe that the material which builds up bone, cartilage, etc., in the fetus passes through the placental barrier in some other form than that in which it is later seen, may it not be true, also, for antibodies? The fetus is provided by the mother with the requisite substances for development, but the antibodies are formed by the fetal tissues. We can conclude that if there is a placental interchange of preformed antibody, it is restricted, or the values would approximate one another.

It is possible that there may be a placental interchange of an activating substance or an antigen. The former possibility is purely hypothetical, but the latter is known to take place. In view of the fact that these cases were tested against *B. typhosus* and that none of the cases gave any history of a typhoid infection, it is highly improbable that any typhoid protein passed through the placenta into the fetal circulation.

The result of the experiments with human colostrum and milk shows that colostrum has little or no bactericidal action, that milk has none, and that colostrum and milk do not contain any complement but are anticomplementary. These facts are not in accord with the idea suggested by Jamulener,³⁴ who in view of his experimental results in animals, concluded that the ingestion of colostrum would increase the antibody content of the serum of children. Smith and Little⁹⁷ pointed out the importance of colostrum to newborn calves, but made no deductions for man.

Does human colostrum or milk contain an activating substance? Thus far, only one serologic activating substance has been found to exist in the body fluids, and that is complement. In the specimens of human colostrum and milk that were examined an anticomplementary substance was found which masked the action of any complement that might have been present. While it seems improbable that human colostrum or milk contains an activating substance, yet this possibility cannot be excluded as a source by which natural immunity may be developed.

If human colostrum and milk do not contain preformed antibodies or an activating substance, the only other way in which these fluids might directly influence the development of an immunity would be by their containing antigen. As the serum of the newborn has a bactericidal action against organisms such as the cholera vibrio, and as cholera is not endemic, it would seem that the normal antibody in the serum is not specific for one organism. Moreover, the serum of the

newborn has a lytic action against the red blood cells of heterologous species. It is very improbable that a specific antigen for such an antibody passed through the placental filter or was conveyed to the infant through the milk. Hence it is not probable that human colostrum or milk directly influence the infant in its development of immunity.

From the present investigations it seems warranted to conclude that the serum of the newborn possesses an antibody content lower than the mother; that placental interchange of antibodies, if it exists, plays a very minor rôle in transferring antibodies to the fetus; and that human colostrum and milk do not contain normal antibodies as measured by the bactericidal test.

This does not mean that one should advocate artificial feeding in preference to breast feeding, for it seems reasonable to believe that breast feeding, by affording better nutrition to the infant, results in the formation of a higher antibody content. This viewpoint was suggested by the work of Moro.⁶⁷ Although he was unable to find any bactericidal action in either human or cows' milk, he showed that if infants were breast fed for two weeks and then artificially fed for two weeks, there was a lowering of the bactericidal action of the infants' serum from 75.8 to 40.7 per cent. Both Wassermann¹⁰⁴ and Römer⁸⁴ concluded that the serum of breast-fed infants possessed a stronger bactericidal action than the serum of artificially fed infants.

Accepting the fact that milk may contain artificial antibodies, it does not necessarily follow that they will be of any value to the nursing child. Schumacher³³ reported the case of a mother who developed typhoid fever towards the end of pregnancy. At birth the infant's serum showed an agglutination titer of 1/10 the value of the maternal serum. On the eighty-third day of life, the infant's serum failed to show any agglutinins for the typhoid bacillus, although it had been nursing, and the milk and blood serum of the mother were equal in their value of agglutinins. Achard and Bensaude² showed that an infant, nursed by a mother who had developed typhoid fever in the puerperium and whose milk contained agglutinins, failed to show agglutinins in its serum. Although v. Zubrzyeki and Wolfsgruber¹⁰³ found normal hemagglutinins in milk, they were unable to demonstrate them in infants breast fed for two weeks, and concluded that the infant either failed to absorb the hemagglutinins or that they were destroyed by the process of digestion. This is in contrast to the opinion of Famulener²⁴ who believed that kids absorbed antibodies from the colostrum of immunized goats. Smith and Little⁵⁷ believed that "there appears to be no function inherent in colostrum which controls development or growth, or which is essential to the starting of the mechanism of digestion, since calves not having had colostrum appear to do as well as the others, when the infection has been over-

come." Gheorghin⁴⁰ reported an epidemic of pneumonia among guinea pigs. The mothers were vaccinated and no new cases developed among them, but there were 25 deaths out of 27 nursing young. It is not known if there were any antibodies in the milk of these animals; obviously, if they were present, they were of no value to the young. Kirstein⁵⁴ showed that, if pregnant women were given diphtheria toxin-antitoxin mixtures, the newborn possessed a high content of antitoxin in their sera. However, these children would contract diphtheria in about the same frequency as children of nonimmunized mothers. He concluded that the newborn child was unable to utilize the antitoxin present in the blood; and that this was substantiated by the clinical observation that often antitoxin injections in the newborn are without any curative effect. While Kuttner and Ratner⁶¹ found small amounts of diphtheria antitoxin in human colostrum, it was much less than that in the maternal or cord blood. No antitoxin was found in human milk. They reported 18 cases in which the infants never received any colostrum and no abnormality was noted in their development. Hence, it seems that the value of colostrum to the newborn child is not that of a protective mechanism such as is seen in the newborn calf.

Smith and Wason,⁶⁸ by maintaining rats on a deficiency diet that caused rickets, found that there was a lowering of the bactericidal action of their serum. Future investigations may reveal whether it is possible to vary the resistance of man to disease by variations in diet.

It seems probable that the rôle of human colostrum and milk is an indirect one, namely, that it maintains the infant in a better state of nutrition than is usually found in the artificially fed infant, thus enabling the tissues to develop a higher degree of resistance.

It is obvious that the factors by which resistance is measured are less in the newborn than in the adult. There is no evidence to warrant the assumption that this deficiency is made up by a transfer of antibodies from the mother through the milk. On the other hand, the evidence indicates that the newborn is entirely independent of the mother in regard to its formation of antibodies. They are formed, probably, in a manner similar to that which controls the growth of the infant.

SUMMARY AND CONCLUSIONS

1. The bactericidal action of human maternal serum is always greater than that of the newborn.

2. The content of complement is likewise greater in the maternal serum than in that of the newborn.

3. Although the maternal serum contains more complement and exhibits a stronger bactericidal action than the serum of the newborn, there is no evident parallel relationship between the two properties.

4. Pregnancy in itself is not responsible for the increased effectiveness of the maternal serum; the difference in the bactericidal values of the sera of mother and newborn is due to an actual deficiency in the serum of the latter.

5. Human colostrum and milk have very little, if any, bactericidal action. They possess an anticomplementary substance which masks the action of any complement that may exist in them.

6. The bactericidal action of serum is not dependent upon complement alone, but its activity is greatly increased by it.

7. These results indicate that the infant is only partially, if at all, dependent upon its mother for the development of normal antibodies, or of natural immunity.

I desire to acknowledge my indebtedness to Dr. George H. Smith for suggestions regarding the serologic methods employed.

BIBLIOGRAPHY

- (1) *Achard*: Compt. rend. Soc. de biol., 1897, xlix, 255-257. (2) *Achard et Ben-saude*: Bull. et mém. Soc. méd. de hôp. de Paris, 1896, xiii, 679-681. (3) *Adair*: Trans. Amer. Gyn. Soc., Phila., 1915, xl, 427-443. (4) *Amberg*: Jour. Am. Med. Assn., 1907, xlviii, 304-308. (5) *Anderson*: Jour. Med. Research, 1906, xv, 241-258. (6) *Bauer and Sassenhagen*: Med. Klin., 1909, v, 1927-1929. (7) *Becker*: Berl. klin. Wehnschr., 1909, xvi, 1016-1017. (8) *Bertarelli*: Centralbl. f. Bakteriöl., 1906, xli, 767-770. (9) *Bertino*: Arch. ital. di guiecol., 1905, i, 97-123. (10) *Bordet*: Ann. de l'Inst. Past., 1899, xiii, 225-250. (11) *Bourquoin*: Am. Jour. Physiol., 1922, lix, 122-143. (12) *Boyd*: Canad. Med. Assn. Jour., 1922, xii, 724-725. (13) *Buchner*: Centralbl. f. Bakteriöl., 1889, v, 817-823. (14) *Idem*: Ibid., 1889, vi, 1-11. (15) *Idem*: Ibid., 1889, vi, 561-565. (16) *Castaigne*: Compt. rend. Soc. de biol., 1897, xlix, 984-986. (17) *Cathala and Lequeux*: L'Obstetrique, 1909, xiv, 393-418. (18) *Chambrelent and Saint-Phillippe*: Quoted by Schumacher, Zeitschr. f. Hyg., 1901, xxxvii, 323-344. (19) *Charrier and Apert*: Compt. rend. Soc. de biol., 1896, xlviii, 1103-1105. (20) *Cooke*: Amer. Rev. Tuberculosis, 1922, vi, 127-132. (21) *Cooke and Vander Veer*: Jour. Immunol., 1916, i, 201-305. (22) *Courmont and Cade*: Compt. rend. Soc. de biol., 1899, li, 619-621. (23) *Dieudonné*: Quoted by Famulener, Jour. Inf. Dis., 1912, x, 332-368. (24) *Dogliotti*: Quoted by Famulener, Jour. Inf. Dis., 1912, x, 332-363. (25) *Edelstein and Flippö*: Ztschr. f. Kinderh., 1920, xxvii, 79-91. (26) *Ehrlich*: Ztschr. f. Hyg. u. Infektionkrankh., 1892, xii, 183-203. (27) *Ehrlich and Hübener*: Ztschr. f. Hyg. u. Infektionkrankh., 1894, xviii, 51-64. (28) *Ehrlich and Morgenroth*: Berl. klin. Wehnschr., 1899, xxxvi, 6-9. (29) *Idem*: Ibid., 1889, xxxvi, 481-486. (30) *Idem*: Ibid., 1900, xxxvii, 453-458. (31) *Idem*: Ibid., 1900, xxxvii, 681-687. (32) *v. Eisler and Solma*: Wien. klin. Wehnschr., 1908, xxi, 684-686. (33) *Etienné*: Presse méd., 1896, ii, 465. (34) *Famulener*: Jour. Inf. Dis., 1912, x, 332-368. (35) *v. Fellenberg and Döll*: Ztschr. f. Geburtsh. u. Gynäk., 1914, lxxv, 285-319. (36) *Flaminio*: Rivista di clin. Pediat., 1908, vi, 572-578. (37) *Fraser*: Brit. Med. Jour., 1895, ii, 416-419. (38) *Friedemann*: München. med. Wehnschr., 1907, liv, 2414-2417. (39) *Gammeltoft*: Ugesk f. Læger, 1913, lxxv, 1247-1259. (40) *Gheorghin*: Compt. rend. Soc. de biol., 1922, lxxxvii, 39-40. (41) *Gozony*: Ztschr. f. Immunitätsforsch. u. exper. Therap., 1913, xix, 172-187. (42) *v. Graff and v. Zubrzycki*: München. med. Wehnschr., 1912, lix, 574-577. (43) *Grünbaum*: München. med. Wehnschr., 1897, xlii, 330-332. (44) *Halban*: Wien. klin. Wehnschr., 1900, xiii, 545-548. (45) *Halban and Landsteiner*: München. med. Wehnschr., 1902, xlix, 473-476. (46) *Hewlett and Revis*: Jour. Hyg. Cambridge, 1914, xiv, 481-497. (47) *Howe and Givens*: Amer. Jour. Dis. Children, 1923, xxv, 63-75. (48) *Howe*: Jour. Biol. Chem., 1921, xlix, 115-118. (49) *Howell and Eby*: Jour. Inf. Dis., 1920, xxvii, 550-556. (50) *Huddleson*: Exp. Sta. Record, 1918, xxxviii, 284. (51) *Hunter and Campbell*: Jour. Biol. Chem., 1918, xxxiv, 5-15. (52) *Jurcawitsch*: Centralbl. f. Bakteriöl., 1902, xxxiii, 76-80. (53) *Kasel and Mann*:

München. med. Wehnschr., 1899, xlv, 581-585. (54) *Kirstein*: Archiv. f. Gynäk., 1921, cxv, 326-349. (55) *Kolff and Noggerath*: Jahrb. f. Kinderh., 1909, lxx, 701-731. (56) *Kopf*: Ztschr. f. Hygiene u. Infektionskrankh., 1909, lxiii, 291-312. (57) *Kraus*: Wien. klin. Wehnschr., 1901, xiv, 737-739. (58) *Kraus and Löw*: Wien. klin. Wehnschr., 1899, xii, 95-98. (59) *Kreidl and Mandl*: Wien. klin. Wehnschr., 1904, xvii, 611-612. (60) *Krönig and Füh*: Monatschr. f. Geburtsh. u. Gynäk., 1901, xiii, 39-54. (61) *Kuttner and Ratner*: Am. Jour. Dis. Children, 1923, xxv, 413-435. (62) *Lane-Clayton*: Jour. Path. and Bacteriol., 1909, xiii, 34-37. (63) *Lewis and Wells*: Jour. Am. Med. Assn., 1922, lxxviii, 863-865. (64) *Little and Orcutt*: Jour. Exper. Med., 1922, xxxv, 161-171. (65) *Löhr*: Ztschr. f. die gesamte exper. Med., 1921, xxiv, 371-380. (66) *Merkel*: München. med. Wehnschr., 1904, li, 329-330. (67) *Moro*: Wien. klin. Wehnschr., 1901, xiv, 1073-1077. (68) *Moriss*: Bull. Johns Hopkins Hosp., 1917, xxviii, 140-146. (69) *Morse*: Bull. Johns Hopkins Hosp., 1917, xxviii, 199-204. (70) *Mossé and Daunic*: Compt. rend. Soc. de biol., 1897, xlix, 238-239. (71) *Much*: München. med. Wehnschr., 1908, ly, 572-574. (72) *Otto*: München. med. Wehnschr., 1907, liv, 1665-1670. (73) *Park*: Proc. Soc. of Exper. Biol. and Med., 1903, i, 19-20. (74) *Pfaundler*: Archiv. f. Kinderh., 1908, xlvii, 260-286. (75) *Pfaundler and Moro*: Zeitschr. f. exper. Path. u. Therapie, 1907, iv, 451-469. (76) *Plass*: Bull. Johns Hopkins Hosp., 1917, xxviii, 137-140. (77) *Polano*: Experimentelle Beiträge zur Biologie der Schwangerschaft, Habilitationsschrift, Würzburg, 1904. (78) *Remlinger*: Ann. d. l'Inst. Past., 1899, xiii, 129-135. (79) *Resinelli*: Quoted by Gozony. Ztschr. f. Immunitätsforsch. u. exper. Therap., 1913, xix, 172-187. (80) *Reymann*: Jour. Immunol., 1920, v, 227-238. (81) *Idem*: Ibid., 1920, v, 391-397. (82) *Idem*: Ibid., 1920, v, 455-463. (83) *Ribadieu-Dumas, Cuel et Prieur*: Rev. de la tuberculose, Paris, 1921, ii, 378-380. (84) *Römer*: Beitr. z. exp. Therap., 1905, vi, 18-41. (85) *Roscnau and Anderson*: Jour. Inf. Dis., 1908, v, 85-105. (86) *Roscherantz*: Compt. rend. Soc. de biol., 1911, lxxi, 142-143. (87) *Sassenhagen*: Archiv. f. Kinderh., 1910, liii, 281-332. (88) *Schenk*: Monatschr. f. Geburtsh., u. Gynäk., 1904, xix, 159-175. (89) *Idem*: Ibid., 1904, xix, 344-359. (90) *Idem*: Ibid., 1904, xix, 568-584. (91) *Scherencziss*: Quoted by Halban and Landsteiner, München. med. Wehnschr., 1902, xlix, 473-476. (92) *Scholtz*: Hyg. Rundschau., 1898, viii, 417-423. (93) *Schumacher*: Ztschr. f. Hyg., 1901, xxxvii, 323-344. (94) *Sherman*: Jour. Inf. Dis., 1919, xxiv, 1-8. (95) *Slemons and Bogert*: Jour. Biol. Chem., 1917, xxxii, 63-69. (96) *Slemons*: The Nutrition of the Fetus, New Haven, 1919, Yale Univ. Press. (97) *Smith and Little*: Jour. Exp. Med., 1922, xxxvi, 181-198. (98) *Smith and Wason*: Jour. Immunol., 1923, viii, 195-200. (99) *Stänbli*: Centralbl. f. Bakteriologie u. Parasitenk., 1903, xxxii, 158-161. (100) *Tunnelliff*: Jour. Inf. Dis., 1910, vii, 698-707. (101) *Idem*: Ibid., 1912, xi, 347-348. (102) *Turton and Appleton*: Brit. Med. Jour., 1907, i, 865. (103) *Veit*: Zeitschr. f. Geburtsh. u. Gynäk., 1900, xlii, 316-329. (104) *Wassermann*: Deutsch. med. Wehnschr., 1903, xxix, 16-17. (105) *Wegelius*: Arch. f. Gynäk., 1911, xciv, 265-300. (106) *Wells*: The Practitioner, 1908, lxxx, 635-638. (107) *Widal and Sicard*: Ann. d. l'Inst. Past., 1897, xi, 353-432. (108) *Wright and Douglas*: Proc. Roy. Soc., 1904-5, lxxiv, 147-159. (109) *v. Zubrzycki and Wolfgruber*: Deutsch. med. Wehnschr., 1913, xxxix, 210-212.

YALE UNIVERSITY MEDICAL SCHOOL.

PAINLESS CHILDBIRTH BY SYNERGISTIC METHODS (SECOND PAPER)*

By J. T. GWATHMEY, M.D., ROBERT ABBE MCKENZIE, M.D., AND
F. J. HUDSON, M.D., NEW YORK, N. Y.

THE first paper on this method for inducing painless labor appeared in the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, of October, 1923, detailing a little over 100 cases and stating the conditions and circumstances under which the method was evolved. Since that time we have had nearly 200 additional cases, making about 300 in all.

Other methods require either an expert anesthetist or are admittedly justified only in specially equipped institutions and not in private practice or even in ordinary hospitals. The synergistic method is so simple and requires so little attention after administration that it can be used in an entirely empirical manner by any physician acquainted with the technique either in the home or the hospital. At first we used ten different ingredients, but one of these and then another has been discarded until today we rely almost entirely upon two drugs for the major effect, that is, magnesium sulphate and ether. The former is given by hypodermic injection, the ether mixed with oil is administered through the colon. We changed the formula over nineteen times, but have now standardized the technique and no change has been made in the last 100 cases.

The technique calls for from one to three hypodermics and one rectal instillation. The first hypodermic is given at the same time as is usual with the Freiburg method, "after labor is well on its way, when the pains are four or five minutes apart, and lasting thirty or more seconds." The first hypodermic consists of one-sixth of a grain of morphine dissolved in 2 c.c. of a 50 per cent solution of magnesium sulphate, and no morphine is given later. The rectal instillation is two and a half ounces of ether with ten grains of quinine hydrobromate in two drams of alcohol, with enough olive oil to make four ounces. Thus the doctor or nurse comes in contact with the patient only four times at the most, and often only twice. The magnesium sulphate is in 2 c.c. ampoules of 50 per cent strength. If the first hypodermic has a marked sedative effect, the instillation is delayed possibly one to two hours; but if not, it is given within fifteen to twenty minutes. As is usual with any retention enema, the patient should be lying comfortably on the left side, the catheter inserted four inches within the rectum, and from three to ten minutes taken

*Read before the section of Obstetrics and Gynecology of the New York Academy of Medicine, Tuesday, February 26, 1924.

for the instillation, then the catheter is quietly withdrawn. The synergistic effect of the drugs is usually noted within fifteen minutes, the patient becoming very quiet and sometimes sleeping. An exhausted woman may even be lightly anesthetized, but analgesia with unconsciousness is the ideal sought.

The effect continues for about four hours, but if insufficient, one or two additional hypodermics of 2 c.c. 50 per cent magnesium sulphate deepens the effect. Pain is eliminated, contractions continue, labor is not delayed, and the memory of events is either clouded or completely obliterated. Sometimes no anesthetic is needed even when the head is passing over the perineum, neither is a supplement required for an episiotomy or repair of lacerations or other necessary work. The mother may not be aware of the birth until told. As with all drugs or systems, the effect varies with the individual patient, her confidence in the doctor, maintenance of quiet, gentle manipulations, etc. On the other hand, loud talking, rattling of pans, and thoughtlessness in other ways will mar what might under other circumstances be an ideal result.

Other methods of giving these drugs have been attempted or may be developed in the future, but no method could possibly be safer or simpler. After each attempt at improvement, we have returned to the technic described. Before proceeding further it might be well to state some reasons for our implicit confidence in its safety:

(1) Four drams of the salts of magnesium sulphate have been given subcutaneously, without deleterious effects, over 200 times at the Presbyterian Hospital¹ of this city. In order to give this amount with our present technic, we would have to administer sixteen hypodermics of 2 c.c. of a 50 per cent solution. We are now using only three hypodermics. Unless chemically pure and sterilized, magnesium sulphate solutions rapidly deteriorate. The ampoules are safe.

(2) Oil-ether colonic anesthesia is used as a routine in many hospitals, the amount of ether varying from four to six ounces—the average being five ounces. We use only one-half as much, or two and one-half ounces.†

(3) Quinine may possibly be given more advantageously by mouth or intramuscularly, or it may be omitted entirely. This will be determined in due course. For simplicity and convenience the present technic will be continued. If increased to 30 grains, toxic effects may follow, including headache, tinnitus, etc.

(4) The small amount of morphine used is not considered dangerous.

(5) The resultant effect of this combination of drugs is a state

†Mucor, saliv., nausea, vomiting, and gas pains are usually absent with ether by rectum. A 2 50 per cent solution of ether in oil kills the colon bacillus in ten minutes, the possibility of postnatal infection from this source is practically eliminated.

of analgesia with unconsciousness, which is as safe as local analgesia and much better than a third degree surgical anesthesia.

(6) The baby usually cries when born. It is the exception to have delayed respiration. This is in marked contrast to scopolamine-morphine analgesia, where there is usually more or less delayed respiration and it is exceptional for the baby to cry immediately.

(7) Labor is not delayed, and a high degree of efficiency is obtained.

Before detailing the results with the standard technique, it may be well to relate our experiences with other methods. During the period from September 1, 1923, to January 1, 1924, Drs. McKenzie and Hudson, house surgeons at the Lying-In Hospital, gave most satisfactory cooperation in the development of this technique. Living in the hospital—each case at all times under direct supervision—their observations and notes are therefore valuable.

Oral Administration of Ether.—The ether was given to 22 cases by oral administration; the magnesium sulphate, by hypodermic. The formula used contained

R̄ Ether	drams iv
Paraffin oil	drams vi
Aqua menth. pip.	M v

The patient is allowed to take approximately an ounce of port wine slowly, holding in the mouth so as to establish the aroma and taste; this is immediately followed by the ether mixture, patient first inhaling deeply, all of it being quickly swallowed, the remainder of the wine then being given to clear away the taste and odor of the ether. The patient is urged to keep quiet for ten or fifteen minutes to prevent nausea. The magnesium sulphate injections are given thirty minutes before or at the time of the oral administration of the ether mixture. Only those cases were chosen where no disproportion existed between the size of the pelvis and fetus, and which promised to make normal progress. The doses were given when the patient was well into labor and when the cervix was from two to four fingers' dilated. In about one-third of the cases the injection of $MgSO_4$ was repeated after one hour. The mixture was not retained in three cases. Three cases received morphine sulphate, gr. $1/6$ in the solution of $MgSO_4$. Fourteen showed a definite sedative effect from the magnesium sulphate-ether combination. Excitement, or symptoms of mild intoxication, was noted after fifteen to twenty minutes in three cases.

Uterine contractions seemed unaffected in nineteen cases; increased in nine; and decreased in two.

Sensation of pain was decreased in eleven; increased in none; not affected in eleven.

There was slight cyanosis of the child in four cases; delayed respiration (one to three minutes) in two.

In the series, no variation from the usual amount of postpartum bleeding was noted.

The fact that there was slight cyanosis in four cases and delayed respiration (one to three minutes) in two, out of a total of twenty-five cases, would seem to indicate that ether by mouth is more dangerous to the fetus than when given through the colon. Compared to this, McKenzie states that "no danger to the fetus was recognized"

in a series of 73 cases. Ether by inhalation is probably also more dangerous to the fetus, since it affects the higher cerebral centers to a much greater extent than when given by the colon. For example, under colonic anesthesia it is not unusual to converse with a patient undergoing an operation for excision of upper or lower jaw, complete excision of breast or any other radical and painful operation. The brain is never as free to coordinate under inhalation ether as with colonic.

From this limited number of cases, we believe there is shown a definite analgesic and moderate sedative effect from the combined action of ether and magnesium sulphate, with a tendency to shorten the first stage of labor by allowing more rapid dilatation of the cervix—and this without detrimental effects to child or mother.

Some means of prolonging the effect would be advantageous, according to Hudson. We now know that the effect would be prolonged by additional (two or three) hypodermies of magnesium sulphate. However as results did not compare with the standard the oral method was dropped.

Normal Saline Instillation.—The technique used in the next series is based upon the fact that one quart of normal saline given by rectum one hour before operation is a good prophylactic measure where shock, especially from hemorrhage, is expected.² Also, all authorities are agreed that the parturient woman accumulates a certain amount of blood over and above that normally in the body, exclusive of the weight of the hypertrophied uterus and its contents. The thought occurs that, when a woman comes to term and labor ceases for a more or less indefinite time, Nature has failed to provide this extra amount of blood in anticipation of a great loss, and so labor automatically ceases. If this theory is correct, by supplying a patient with the necessary amount of fluid in the form of normal saline, and at the same time administering analgesics to abolish the element of fear, the woman should proceed with labor. Certainly neither mother nor child would be injured by the procedure, and both should be helped. The following formulae were used: No. 1. Urea 1 per cent, $MgSO_4$ 6 per cent, Distilled Water q.s. ad. 4 ozs. No. 2. Ether $2\frac{1}{2}$ oz., Glucose 1 oz., Water 1 quart. (Ether in solution $7\frac{1}{2}$ per cent.)

Dr. Hudson's notes follow:

Report of cases in which a 6 per cent solution of ether in water was given by Murphy drip with the intention of causing stimulation of uterine contractions or, where no pains were present, of inducing labor. The Murphy drip was begun after the lower bowel had been thoroughly cleansed by soap suds enema. The average time required for administration of the one quart mixture was two hours and twenty-five minutes. The usual time for administering one quart for surgical cases is twenty minutes..

CLASS A. Case 2, para ii, had pains before admission to hospital, but no pains after coming in. Started Murphy drip one hour and twenty minutes later; cervix

hard, one and one-half fingers' dilated. Given MgSO_4 (25 per cent solution) 2 c.c. Patient becoming restless, with pains in the back, two hours and forty-five minutes after starting; repeated MgSO_4 and added morphine, gr. $\frac{1}{4}$. Eight P. M. (three hours, five minutes after starting) gave orally mixture of oil, ether, and port wine. This was not retained. At 9 P. M. (four hours, five minutes) cervix five fingers' dilated and soft. Normal delivery at 9:45 (four hours, fifty minutes after starting). Child showed slight cyanosis and respirations were delayed a short time (50 seconds). Moderate amount of bleeding. Uterine contractions strong and regular. The mixture was poorly absorbed, so patient really took only about one pint of the ether-saline mixture.

CLASS A. Case 3, para i, had labor pains early in the morning, but these subsided about 11:00 A. M.

11:50 A. M. gave morphine, gr. $\frac{1}{8}$ in MgSO_4 25 per cent. Cervix at this time was thick, two fingers' dilated.

12:15, started Murphy drip. Patient restless after two hours. Expelled much of solution, but went on with labor.

8 P. M. pains strong and regular, but cervix dilating poorly (three and a half fingers).

10:50 P. M. given morphine, gr. $\frac{1}{8}$ (hypo).

Delivery normal at 1:00 A. M., twelve hours and forty-five minutes after starting rectal instillation. Baby's condition good.

CLASS B. Case 4, para ii, having occasional slight pain. Cervix at this time was thick, two fingers' dilated.

12:10 P. M., started Murphy drip. No immediate result noted. Small portion expelled.

3:40 P. M., magnesium sulphate, 25 per cent solution. No sedative effect seen, but uterine contractions became regular and strong by 8:00 P. M. Patient very noisy and difficult to control; results were difficult to determine.

Normal delivery at 10:50 P. M.,—about eleven hours. Conditions good; normal amount of third stage bleeding.

CLASS B. Case 5, para i. Pains regular and fairly strong when rectal instillation was begun (4:55 P. M.). Cervix two fingers' and thin. After thirty minutes, tube was removed and a small amount of the mixture expelled. For two hours a slight sedative effect was noted, the patient remaining stuporous; after this period the contractions became normally severe, with the usual amount of pain. Delivery normal at 11:30 (seven hours). Baby crying.

Case 6, para v. No pains or uterine contractions: cervix soft, one and a half fingers' dilated. Murphy drip given, requiring one hour and fifteen minutes, at the end of which period patient was drowsy. Slept at intervals and had no uterine contractions or pains. This condition lasted for two hours. Was up about the ward the following day, and discharged from hospital until labor pains might begin. Supposedly full term patient. This case is important,—if any conclusions may be drawn from one case:—inasmuch as the method is not an abortifacient, and unless full term has been reached the technic is unimportant.

This last mixture has not been given in a sufficient number of cases to enable us to draw any definite conclusions. Theoretically, it is the most logically correct of the three methods here outlined.

Magnesium Sulphate Injections.—Five cases were given injections of magnesium sulphate only. At the time when pains were strong and the cervix three fingers' dilated—two c.c. of a 25 per cent solution in three cases, and 2 c.c. of a 50 per cent solution in two cases.

Some analgesic effect was noted in all, being slight in two cases and sedative in three. No effect seen on the uterine contractions; no detrimental effects noted on babies. Morphine sulphate, grs. $\frac{1}{6}$, was included in one of the injections of 25 per cent solution.

Whenever morphine has been given to cases in labor it has been given in 2 c.c. of a 25 per cent solution of magnesium sulphate, since the action seems definitely prolonged by this combination.

At the same time that these procedures were being carried out, the standard technic was being used on another class of patients with uniform success. This formula consisted of:

R	Quinine hydrobromide	grs.	10
	Alcohol	drams	2
	Ether	ozs.	$2\frac{1}{2}$
	Oil	oz.	1

On September 1 a change was made in the formula, just as the House Staff changed. A series of mishaps occurred; patients became boisterous and had to be restrained, but there were no accidents to mother or child.

About this time, at McKenzie's suggestion, we decided to grade all patients "A," "B," "C," or "D," so that we could more intelligently change the formula or technic.

Key to Tabulation.—A favorable result is listed in the tables as "A." Sedative effect less complete or not so prolonged is classed "B". Those cases in which patients fail to lose themselves in sleep but feel senses clouded and know pain less acutely are grouped as "C". The poor results, i. e., where effect is negligible or where complications ensue have been designated "D". McKenzie's notes follow tabulation.

Formula No. 1

Quinine Hydrobromide	gr.	15	} Total 9 cases
Alcohol	drams	3	
Ether	ozs.	3	
Oil	q. s.	ozs.	

The results with this mixture were so uniformly unfortunate that its use was discontinued after trial in nine cases. In seven of these cases marked excitement followed the injection. Cerebral stimulation and extreme restlessness proved quite alarming and altogether unsatisfactory. Memory for events during these periods was wiped out, however. The patients recalled nothing of their labor, although reminiscent in some cases of the shouting and singing to which they gave themselves. Two of the cases in this group gave excellent results—prolonged sedative effect and complete loss of memory.

CASE No. 4, 85463, Results "D", Formula No. 1.

Administration	{	3:00	Initial hypo. (Morph. gr. $\frac{1}{8}$ -Mag. Sulph. 25%)
		3:45	Rectal Instillation
		4:30	Hypo Mag. Sulph.
		5:30	Hypo Mag. Sulph. and Morph. gr. $\frac{1}{8}$
		11:00	Delivery

Slight sedative effect with marked excitement and vomiting. Administration O. K.
Discarded formula.

Large, muscular young woman, para i, hard dry labor, great apprehension. No appreciable effect from preliminary hypodermic of morphine and magnesium sulphate. Instillation well retained. Patient became almost immediately talkative and dis-oriented. For three hours, periods of quiet alternated with restlessness and mental stimulation (singing and talking). Vomiting occurred several times. Normal second stage; patient not difficult to control. Chloroform given during last half hour. Baby O. K.

In order to correct the excitement stage, the formula was weakened in every way; formula and McKenzie's notes follow:

Formula No. 2

Quinine hydrobromide	gr.	5	} Total 16 cases
Alcohol	drams	2	
Ether	ozs.	2	
Oil q. s.	ozs.	4	

Note: This mixture employed in sixteen cases gave unsatisfactory results in the majority of instances. Very slight sedative effect in many cases with increased annoyance to the patient, and a tendency to undue excitation caused this formula to be discarded.

	A	B	C	D	} 16 cases, No. 2 formula
Primip.	3	2	4	2	
Multip.	1	1	2	1	
Total	4	3	6	3	

Factors having a tendency to cause excitement would be a too rapid injection of the instillation, air forced into the colon, inability of the patient to understand English or to appreciate the objective desired. A third change was now made, also a return to the gravity method of instillation—the syringe used only when indicated, i.e., when the gravity method was impractical.

Formula No. 3 (now in use in all Cases)

Quinine hydrobromide	gr.	10
Alcohol	drams	2
Ether	ozs.	2½
Oil q. s.	ozs.	4

	A	B	C	D	} 45 cases, No. 3 formula
Primip.	26	8	1	1	
Multip.	4	4	1		
Total	30	12	2	1	

CASE No. 1, 85923, result "B," formula No. 3.

Initial hypo (Morph. gr. ⅙ and Mag. Sulph.) at 7:15

Rectal Instillation 7:30

Hypos of Mag. Sulph. at 8, 9, 10 and 11

Patient an intelligent Danish girl, para i. Instruction and later questioning conducted through interpreter. Pains frequent and severe, cervix 3 fingers', thick, soft. Morphine given 15 minutes before instillation. Patient complained of burning in rectum but retained the injection. Sleep did not follow as in most cases.

Patient restless, with pain and vomited a number of times. Behavior in second stage good. Spontaneous delivery six hours after instillation.

Upon questioning on day after labor patient states that she felt contractions but knew little pain. Felt as if in a daze, impressions indistinct, remembers vomiting and hypodermic injection vaguely. Was conscious even during labor of relief by treatment and remains very grateful.

CASE No. 2, 83942, result "A," formula No. 3.

5:00 P. M. Hypo Morph. gr. $\frac{1}{8}$ Mag. Sulph. 50 per cent c.c.

7:00 P. M. Rectal Instillation

7:30 P. M. Hypo Morph. gr. $\frac{1}{8}$ Mag. Sulph. 2 c.c.

11:00 P. M. Hypo Mag. Sulph. 2 c.c.

12:00 M. Delivery

Young colored woman, para i, dry labor. Strong, frequent pains through afternoon, cervix only 2 fingers' and thick. At 7 P. M. instillation given. Immediate sedative effect, patient sleeping quietly then for four hours. At this time began to stir and groan with pain until in a short while caput appeared at perineum. Spontaneous delivery in 5 hours after instillation. Small amount of ether given. Patient very grateful for analgesia afforded. Remembers indistinctly strong bearing down pains just before ether given. States that early pains of dilation before injection were most trying part of whole labor.

CASE No. 3, 85560, result "A," formula No. 3.

4:00 A. M. Rectal Instillation

4:10 A. M. Hypo Morph. gr. $\frac{1}{8}$ Mag. Sulph. 50 per cent 2 c.c.

9:00 A. M. Delivery

Turkish woman speaking no English. Instillation given as soon as patient was admitted and examined. Patient obviously suffering great pain, particularly in the back. Cervix 2-3 fingers'. Hypodermic given immediately after instillation. Patient went to sleep, remained very quiet for three hours, although at one time when disturbed for examination was well oriented. After three hours hard bearing down pains began, patient made no outcry, pushed very well, and dozed between contractions. A little chloroform given to retard progress while head delivered. Delivery five hours after instillation.

Administration.—Selection of cases is of utmost importance as well as time of treatment. The ideal case, a primipara with cervix rigid, firm, 2-3 fingers, having strong frequent contractions and distressed with pain and fear can, of course, be only approximated in most instances. Adequate cooperation on the part of the woman in labor involving first, proper comprehension of purposes of treatment and second, the measure of control to insure its success, frequently cannot be obtained. In fact the results tabulated as noted have been obtained in a remarkably diverse collection of patients often incapable of receiving any instruction, and with the instillation analgesia employed at such varied stages in the course of labor as circumstances and individual peculiarity made possible.

The synergistic principle previously stressed has not been neglected and further reliance is placed on subcutaneous injection of magnesium sulphate solution as experience demonstrates its value. It might be mentioned at this point that 50 per cent magnesium sulphate employed in the last 25 cases has shown its desirability over the less concentrated solution.

A preliminary hypodermic of morphine sulphate grains $\frac{1}{8}$ or $\frac{1}{6}$, dissolved in 2 c.c. of 25 per cent or 50 per cent magnesium sulphate is almost invariably employed, and serves well to lessen the patient's discomfort and dull sensibilities otherwise somewhat aroused by the rectal injection. The instillation is given one-half to one hour

later with the patient in bed, removed whenever possible from distracting sights and sounds. The attitude assumed by patient lying on left side with hips somewhat elevated is conducive to comfort as well as favoring absorption of injection. Utmost importance is attached to elimination of fecal material from the rectum, a cleansing enema being frequently necessary before the instillation is given. Care is taken to introduce the ether and oil slowly without inclusion of bubbles of air. The gravity method is used where the fluid runs in easily, although some pressure with barrel of syringe is often necessary. Patients complain only of brief slight burning in rectum. In only three cases—not included in series here reported—has the mixture been expelled in whole or in part.

Where good effect follows instillation no further medication need be given. In not a single instance among 200 cases has the method come under suspicion, neither has the life of the mother or child been jeopardized. It is now being used (formula No. 3) in the Out-Patient Department. If successful here, it will prove our hypothesis that the method is so simple that it can be used anywhere, by any physician, and in an empirical manner.

General Impression of Results (McKenzie): "To all observers, an impression of real benefit to patients is apparent. The contrast between a restless, apprehensive woman suffering acutely with continual backache and sharp recurring pains, tired out also by her early efforts at dilatation of the cervix and the quiet sleeping, or drowsy, unworried patient stirring only when contractions occur, is striking. There are no offensive dreams and rarely any untoward cerebral excitement to mark the period of stupor immediately following instillation. In the ideal case the patient remains sleeping or quiet for about four hours, proceeding then to pick up the task of labor with renewed strength and uncomplaining vigor. She appears refreshed, no longer apprehensive, and oftentimes retains her drowsiness through a severe second stage and delivery. In a number of instances labor has progressed so rapidly that the head descends to the perineum without appreciation by patient. In the larger number of cases a fairly normal sensation in second stage of labor is anticipated.

Progress in labor is not retarded.—The cervix softens more rapidly under influence of analgesic injection and pains succeeding upon periods of apparent inactivity are stronger and more effective by reason of the rest afforded patient.

No danger to the fetus has been recognized.

This method must not be confused with oil-ether anesthesia, as a comparison between the synergistic method and the colonic, as used by Thaler and Huber for the same purpose, that is painless childbirth, will readily show. In Thaler and Huber's series, using only the oil-ether, the dose was repeated twice in 25 cases, three times in 20 cases, four times in 15 cases and five times in 12 cases; 88 cases received an average of $3\frac{3}{4}$ ounces of ether, and one case received as much as $7\frac{1}{2}$ ounces of ether. With the synergists, the injection is never repeated. The total amount, $2\frac{1}{2}$ ounces, is never exceeded. The reduced amount of ether is explained by the synergizing of the magnesium sulphate with the ether.

In using the synergistic method for painless childbirth, we utilize to the fullest extent the analgesic properties of ether. We can get the cooperation of the patient if desired. In private practice, where the practitioner has the full confidence of the patient and the cooperation

would be 100 per cent, the synergistic method would be much more satisfactory and efficient than in any hospital ward service.

Looking forward, we may state that by judiciously modifying and combining the three methods outlined—oral, colonic, Murphy drip—we hope not only to have normal labor painless from commencement to the completion of whatever repairs may be necessary but also to be able within certain limits, to control the time of delivery by what may be considered physiologic methods. For the present: the standard technic of three hypodermics and one instillation is simple, safe and efficient.

REFERENCE

(1) Jour. Am. Med. Ass'n., August 6, 1921, vol. 77, pp. 421-23.

(2) Wells, Am. Jour. Surg., July, 1923.

40 EAST FORTY-FIRST STREET.

(For discussion see page 238.)

END RESULTS AFTER OPERATIONS IN 53 CASES OF UTERINE PROLAPSE*

By HERMANN GRAD, M.D., F.A.C.S., NEW YORK CITY

(Attending Surgeon, Woman's Hospital.)

THIS study of prolapsus uteri is based on 53 cases operated upon by myself during five years beginning 1915, many of which have been under observation over five years.

Passive and active causes for prolapsus uteri are described. Among the passive causes the following conditions are enumerated, which favor a descensus of the uterus: (a) faults in the perineum; (b) in the vaginal walls; (c) in the uterine ligaments; (d) in the cellular tissue; and (e) in the pelvis.

An intact female perineum with normal function, gives support to the female pelvic organs indirectly during moments of increased intraabdominal tension, such as coughing, sneezing and lifting. Muscular contraction of the perineum guards and supports the pelvic organs from undue tension. This function of the perineum is Nature's prophylactic measure against prolapsus uteri, although prolapsus occurs with intact perineum.

A lacerated perineum favors descent of the uterus, nevertheless a complete prolapse of the uterus with a complete tear of the perineum is quite rare.

Complete laceration of the perineum usually occurs during labor in those cases where there is a short transverse diameter of the pelvic outlet. The rami of the pubes in forming a less obtuse angle at the

*Read at a meeting of the New York Obstetrical Society, Feb. 12, 1924.

symphysis protects from injury the fascia of the anterior wall of the vagina and the fascial layer of the cardinal ligaments by the oncoming head of the baby. On the other hand, with a more obtuse angle of the rami of the pubes, the fetal head in labor traumatizes and lacerates the fascial support of the bladder and uterus and the occurrence of prolapsus uteri is favored.

To what extent the faulty conditions in the vaginal wall, cellular tissue, and pelvic bones favor the occurrence of a procidentia is more of an academic interest than practical value.

Faulty conditions in the uterine ligaments are the chief cause in the production of procidentia uteri. By uterine ligaments not only the round ligaments, the broad ligaments and the utero-sacral ligaments are included but also those ligaments which include the pelvic fascia and the so-called cardinal ligaments. This leads not only to retroversion and retroflexion but to complete procidentia of the uterus and uterine adnexae and is by far the most important condition to be considered in dealing with the subject of the etiology of the uterine prolapse.

Increased intraabdominal pressure is the most important active causative factor in procidentia uteri. Long continued downward pressure of the pelvic contents may so weaken the pelvic diaphragm as to cause herniation of the pelvic organs. We therefore find procidentia more frequently in the working woman, and more frequently in the parous than the nulliparous woman.

By far the greatest number of prolapsus uteri are acquired. Childbirth is the great etiologic factor in causing uterine prolapse. With the uterine support gone, herniation of the female pelvic contents results. The degree of prolapse will depend upon the degree of destruction, which, of course, must necessarily vary with each individual case, because the forces operative in each labor must of necessity also vary. In some cases the initial prolapse occurs along the plane of the urinary bladder, as a result of a destruction of the fascial plane that gives support to the bladder. A cystocele develops first, as this viscus descends, it draws downwards other pelvic organs along their planes. In other cases the uterus retroverts and the cervix prolapses along its own plane and appears at the vulva. In still other cases at first a rectocele with a descent of the cervix occurs. In a certain proportion of cases a herniation of all the female pelvic organs occurs, constituting the cases with a third degree of prolapsus uteri.

The 53 cases here reported have been divided into three classes:

1. Cases in which the prolapse developed after the first childbirth.
2. Cases in which the prolapse developed after two or more labors.
3. Cases in which the prolapse developed after the climacteric period.

1. That prolapse develops in 21 per cent of cases after the first childbirth, and that 72 per cent of the prolapse is of the third degree.

2. That in 39 per cent of cases the prolapse comes on after two or more children are born and that 71 per cent of the prolapse is of the third degree.

3. That prolapse develops during the climacteric period just as frequently as during the active childbearing period in 39 per cent of cases and that 76 per cent of the prolapse is of the third degree.

4. That instrumental deliveries appear to have no bearing on the cause of uterine prolapse as statistics show that there were as many prolapses in the noninstrumental deliveries as in the forceps deliveries.

The complications in the 53 cases were as follows: 5 had fibroids of the uterus, 3 ovarian cysts, 1 salpingitis, 3 hernias (one inguinal and two ventral), 1 rectovaginal fistula, 1 hemorrhoids, 1 retained secundines, and 1 myometritis.

There were 236 pathologic lesions in the 53 cases operated upon.

There were 216 operations performed on 53 cases. In 35 cases the cervix was amputated; 23 cases had the uterus interposed; 42 had an anterior colporrhaphy performed. The perineum was repaired in 50 cases although the records show that a laceration of the perineum was recorded in only 45 cases. I consider perineorrhaphy an essential step in every operation for procidentia. While the perineum does not give support to the uterus *per se*, it sustains the pelvic organs during moments of increased intraabdominal pressure. In 22 cases the uterosacral ligaments were shortened by a special method to be described later. Seven cases had a vaginal hysterectomy performed. In one case the abdomen had to be opened on account of uncontrollable hemorrhage from an anterior colporrhaphy.

The results of the operations on the 53 cases of procidentia were as follows: 27 cases were successful (75 per cent); 6 cases were partially successful (17 per cent); 2 cases died (3.7 per cent); 17 cases were not heard from. If the 6 cases of partial successes are included among the successful ones there is 97 per cent of successful operations. To thus include the partially successful cases with the successful ones is permissible because the procidentia was cured in every one of these cases and only part of the various operations performed were unsuccessful. Under these conditions the percentage of successful cases was 92.

Interposition was done 23 times, mostly on cases of procidentia developing after the climacteric period. It is an operation appropriately designed for this class of cases. There was one death in these 23 cases. Interposition is not a time-consuming operation and therefore lends itself to those cases of prolapse where a prolonged operation is not to be undertaken on account of the general condition of the patient. In the postclimacteric procidentia cases the uterus is

small, having undergone involution, and therefore the organ adapts itself to the operation. Some of my most grateful patients are old women who have been relieved of their procidentia by this simple but safe operation.

In three cases interposition was done in young women, Nos. 16, 18 and 23. These three patients were still in the child-bearing periods and the operation was chosen because it appeared to be best suited. In two, both tubes were also resected to insure sterility. In Case 23 the tubes were not resected, because the patient took the anesthesia very poorly and the operation had to be ended as quickly as possible. This patient had a stormy recovery but has remained well and cured of her procidentia. She has been under observation for five years.

In the 23 cases of interposition, 19 were entirely successful, the procidentia was relieved and the patients were entirely satisfied. Two cases are put down as partially satisfactory because they were not, strictly speaking, successes in every way. In one case the rectocele recurred and in one case the anterior wall of the vagina was shortened. Nevertheless in both of these cases the procidentia was relieved. One case died of gangrene of the left leg, a very rare complication, and strictly speaking it should not be charged up against the operation.

In four cases the prolapse was of the first degree only. In addition to the interposition, the uterosacral ligaments were also shortened by the vaginal route. In the light of experience it was unnecessary to burden the patient with this additional operation. The cases that were subjected to the interposition alone fared as well as those with shortening of the uterosacral ligaments. There were 2 cases with second degree prolapse and 17 cases with third degree of prolapse.

The end results of the operation show that 9 cases were not heard from after the operation, leaving 14 cases to be accounted for. Eleven cases were entirely successful. Two cases were partially successful. Eleven cases out of 14 gives 80 per cent of permanent cures, and as the 2 other cases of partial successes were also relieved of the prolapse, it is entirely permissible to say that 13 cases out of 14 were successful and therefore the percentage of cures was 93.

In two cases, Nos. 2 and 28, the rectocele recurred. In two, Nos. 26 and 41, the perineal operation was a failure and in two, Nos. 32 and 40, the anterior wall operation was a failure. In case No. 41 the perineum broke down after a childbirth subsequent to the operation.

One case, No. 33, was a failure. The cause of the failure was due to an error in surgical judgment. The circumstances were as follows: The patient had a complete prolapse, with eversion of the vaginal walls. The uterus had become pregnant in this prolapsed condition and the patient was suffering with an incomplete abortion. She had one child and was very anxious for a second. The patient also had a

very tender appendix which required removal. Nothing short of a vaginal hysterectomy and utilization of the broad ligaments, for the support of the vaginal prolapse, should have been considered in this case. Instead of a vaginal hysterectomy, the following operation was done. The uterus was everted to clear it of the retained secundines and a week later the plastic operation done as well as the laparotomy for the removal of an infected appendix. Four months later the uterus completely prolapsed again. Abdominal shortening of the ligaments does not and cannot give permanent support to a uterus and adnexae that are in a state of complete prolapse. Looking back on the case, I believe that the following procedure should have been adopted. The uterus should have been everted and the appendix removed at one sitting and a vaginal hysterectomy with the necessary plastic operation done at the second sitting. This case was successfully operated upon by me on April 4, 1922. A vaginal hysterectomy and plastic operation were done seven years after the first operation.

There were two deaths in this series, Nos. 19 and 22. Case 19 died of gangrene of the left leg—a very rare complication. The case was a poor surgical risk and should not have been operated at all. She was incapacitated by a third degree of prolapse, a rapid operation was decided upon on account of her general poor condition. The uterus was interposed and the perineum repaired. She recovered from the operation, developed a phlebitis and died with gangrene of the left leg.

The second case, No. 22, died of general peritonitis following a hysterectomy and plastic operation, a purely unavoidable death. The case was a good surgical risk in every way. The patient was 55 years old and had a complete prolapse.

Out of 53 operated cases, only 34, or 64 per cent, could be traced. Fifteen cases were observed for a period of from one year to five years, and nineteen for from one to eleven months.

The statistics here given of the 53 cases of procidentia uteri were carefully compiled and honestly presented. Two operations utilized in these cases, amputation of cervix and vaginal shortening of the uterosacral ligaments, are here described in detail.

AMPUTATION OF CERVIX

A circular incision is made around the cervix, at the junction of the normal mucous membrane of the vagina and the granulation tissue of the cervix or, where the mucous membrane joins the scar tissue of the laceration. The cervical tissue is laid bare of all mucous membrane, the large blood vessels severed are picked up individually and tied. By laying bare the cervix of all its attachments a very good cuff of mucous membrane is obtained. The cervix is now cut across at the internal os or at a lower point, depending upon the operator's desire to amputate

the cervix high up or lower down. The cervix having been amputated, the next step is to suture a flap of tissue of the mucous membrane of the vagina to the edge of the uterine canal to prevent stenosis. It is my practice to use six canal sutures, three above and three below.

In tying the sutures placed in the manner shown (Fig. 1) it is important to guard against strangulation of tissue by tight sutures. The loop pulls the vaginal mucous membrane into the canal of the uterus, but it should be tied so loosely that a space is left between the knot and the mucous membrane, sufficient to admit the point of an artery clamp. The other canal sutures will reinforce the loop of the first canal suture sufficiently to hold it in place. Tissue constriction should be avoided in every possible way as it leads to necrosis of tissue and interferes with

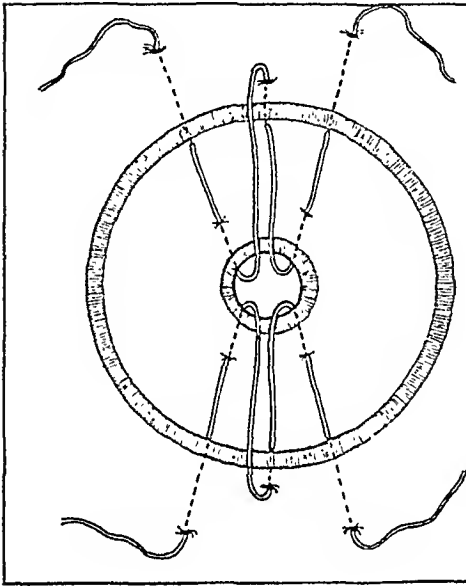


Fig. 1.

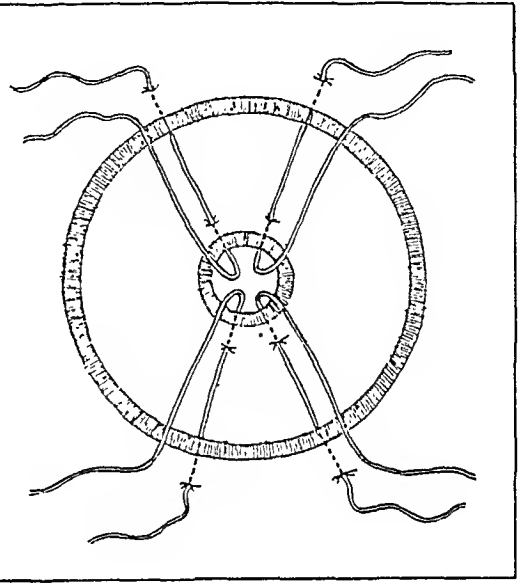


Fig. 2.

Figs. 1 and 2.—Diagrammatic representation of amputated cervix, showing manner of inserting the primary sutures (Fig. 1) and the additional sutures (Fig. 2).

proper healing. Furthermore a cervix operation that heals by granulation is apt to leave a stenosis of the external os, and cause a great deal of scar formation. Necrosis of tissue due to tight sutures may cause secondary hemorrhages.

VAGINAL SHORTENING OF THE UTEROSACRAL LIGAMENTS

The fundus of the uterus is delivered into the vagina, as is done in the interposition operation. By pulling on the fundus uteri the uterosacral ligaments come into view and can be outlined. With a linen suture the edges of the uterosacral ligaments are picked up, about an inch and a half from their uterine insertion. A stab wound is now made beneath the broad ligament from the vagina into the peritoneal cavity, close to the cervix, on either side. Through these stab wounds are drawn the two linen sutures. It is to be noted that the linen suture in the right uterosacral ligament is brought out on the left side of the cervix and the suture in the left uterosacral ligament comes out on the right side of the cervix. The uterosacral ligaments are then drawn through the stab wound and sutured to the anterior surface of the cervix of the uterus. This procedure has the effect of pulling the cervix into the hollow of the sacrum. A very substantial support for the uterus is thus created. This operation was utilized in 24 of the cases here reported. The technic is comparatively easy. The ligament is not severed from

the uterus as in the Jellet operation. Should the uterosacral ligaments be short and not reach around the cervix, they can be sutured to the side of the cervix with equal success.

From the study of these cases of prolapse here presented and from practical experiences in dealing with proeidentia, in its various phases, the conclusion has been reached that the first and second degrees of prolapse require practically the same surgical procedures. In a small number of cases of first degree of prolapse an elongation of the cervix with retrodisplacement of the uterus is the only pathologic condition that needs surgical correction. While these cases are not strictly speaking proeidentia cases, from the patient's point, they are, because they produce the same symptoms. In this class of cases, we are apt to do too much plastic work, and subject the patient to unnecessary traumatism and morbidity. An amputation of the cervix with a perineorrhaphy brings about a very satisfactory and permanent result.

In the cases with second degree of prolapse, more extensive plastic work is called for to bring permanent relief to the patient. In these cases, an amputation of the cervix and a plastic operation on the anterior wall of the vagina for the cure of the cystocele is of great importance, which is to be combined with perineorrhaphy.

In the third degree of prolapse the problem is an entirely different one. These prolapse cases must be carefully studied to arrive at a proper conclusion as to what type of operation is best suited for the particular case. Shall the operation be one of a plastic nature alone or shall a hysterectomy also be done, or should the patient have an interposition operation? These three types of operations call for discrimination and consideration as to the physical condition of the patient. The age of the patient and social status are also of importance in the consideration of the type of operation to be advised for this particular case. Attention has already been called to the satisfactory results that were obtained with interposition in patients in the advanced period of life. In many cases nothing short of a vaginal hysterectomy will give results. A hysterectomy, however, has its morbidity and also its mortality, an important consideration in prolapsus uteri, as is shown in the statistics. Hysterectomy was performed seven times (13 per cent) in my series, and it is in these cases that a fatality occurred in a patient who was a very good surgical risk, and the operation was devoid of any technical difficulties. She stood the operation well and died of peritonitis. It was impossible to discover the source of the infection.

ANALYSIS OF OPERATIONS

Eight different operations were utilized to correct prolapse in my series. There were 27 operations performed in eight cases with first

degree of prolapse, making an average of $3\frac{3}{8}$ operations for one case. Twenty-one operations were done in six cases with second degree of prolapse, making an average of $3\frac{7}{8}$ operations for each patient. The 39 cases with third degree of prolapse had 141 operations performed, making an average of $3\frac{6}{8}$ operations for each case. In the total number of cases, 189 operations were done, an average of $3\frac{5}{8}$ operations for each case of prolapse. Sixty-six per cent of the patients had the cervix amputated; 79 per cent had an anterior colporrhaphy; 94 per cent had perineorrhaphy; 43 per cent had interposition; 41 per cent had the uterosacral ligaments shortened; 13 per cent had vaginal hysterectomy.

The same type of operation was used in each one of the three degrees of prolapse. In the cases with first degree of prolapse the anterior wall was operated on in 37 per cent of cases, while in the cases with third degree of prolapse this same operation was done in 89 per cent of the cases. The same is true of perineorrhaphy. In the first degree of prolapse it was done in 87 per cent of cases, in the third degree in 97 per cent. Interposition was done in the cases with first degree of prolapse, in 50 per cent, 33 per cent in the second degree and 43 per cent with third degree.

CONCLUSIONS

From the study of the 53 cases of prolapsus uteri here presented the following conclusions are justified:

1. That childbirth is the cause of prolapsus uteri.
2. That in 21 per cent of cases the prolapsus develops after the first childbirth and that in 72 per cent the prolapse is of the third degree.
3. That in 39 per cent of the cases the prolapse came on after two or more children were born, and that 71 of the cases had a prolapse of the third degree.
4. That instrumental deliveries appear to have no bearing on the cause of uterine prolapse. There were 41 per cent of instrumental deliveries as against 59 per cent of noninstrumental deliveries.
5. With the advance of the age of the patient, there is a progressive increase in the percentage of the number of the third degree of prolapse.
6. Complications are fairly frequent in procidentia uteri.
7. Operations are successful in 75 per cent of cases.
8. There is a morbidity and a mortality rate to be considered by the surgeon in operating for procidentia uteri.
9. Interposition is a useful operation in all of the three degrees of prolapse.
10. The same type of operation was used in the various degrees of prolapse.

FURTHER OBSERVATIONS OF INTRACRANIAL HEMORRHAGE IN THE NEWBORN; SIGNIFICANCE OF YELLOW SPINAL FLUID AND OF JAUNDICE IN THESE CASES*

BY WILLIAM SHARPE, M.D., AND A. S. MACLAIRE, M.D., NEW YORK, N. Y.
*From the Neurosurgical Department, N. Y. Polyclinic Hospital and Postgraduate
Medical School.*

A CAREFUL survey of the literature of conditions of intracranial hemorrhage in the newborn has revealed a keener interest in this subject within the past six years; with few exceptions, the majority of observations have been recorded by Americans and of the many contributions the pediatricians are apparently the specialized group most aware of this rather frequent complication of birth. It is true that the pathologists were the first to focus attention upon this serious condition in its clinical aspect and especially the milder degrees not resulting in the death of the patient. The neurologist rarely sees these patients in the acute stage and the orthopedist never, so that it is upon the obstetrician that the profession depends for the early diagnosis of the condition and its appropriate treatment.

The large intracranial hemorrhages in the newborn not only produce definite clinical signs but they usually end fatally within several days after birth, so that their recognition is comparatively a simple one; it is the mild cases, however, and the so-called "signless" ones that frequently escape an early diagnosis, only to be suspected months and years later if the hemorrhage has not been entirely absorbed. The chronic condition of cerebral spastic paralysis in its various forms associated with mental retardation need only be mentioned, as the treatment of the older patients can permit, at the most, an improvement only, and by no means a cure.

Although Mr. Little,¹ in 1862, first promulgated the theory of the definite relationship between intracranial hemorrhage at birth and cerebral spastic paralysis and McNutt,² in 1885, confirmed this opinion and placed the subject upon a firm basis by careful pathologic studies, yet no real advance in the clinical diagnosis was made until the last decade.

INFANTILE INTRACRANIAL ANATOMY

The newborn babe is so different from the adult in its cerebral anatomy as in other structures that it is not surprising that intracranial accidents occur rather frequently; in fact, it is amazing that the per-

*Presented at the Boston Obstetrical Society, Jan. 22, 1924.

centage of birth trauma is not higher than indicated by the statistics^{3, 4} in these three series of cases—300 in all.

Brindeau,⁵ Cushing⁶ and others have observed that the number of supracortical veins running from the piaarachnoid to the sinuses are free and unsupported by any connective tissue or dural coverings, thereby rendering these vessels more liable to rupture; they are most numerous, in the parietal and frontal regions and are grouped in the immediate vicinity of the sutures, especially the frontoparietal and sagittal. The diplöe is absent until the second year of life. Browning has demonstrated that Pacchionian bodies are not present at birth and are a matter of postnatal development, probably not completed until about the twentieth year. The middle meningeal artery usually runs vertically up the squamosphenoidal suture instead of backward and it divides into three branches instead of only two. The Rolandic area lies adjacent and immediately posterior to the coronal suture and runs parallel with it. The fontanelles are covered with two main layers only—the skin and superficial fasciae constituting one layer, and the other, the membranous interosseous layer, being composed of fused periosteum and dura, and it is impossible to separate them.

ETIOLOGY

There seems to be a consensus of opinion among investigators in this field that the cause of this condition can be attributed to one of the following main groups or to a combination of them: a. trauma, b. asphyxia or congestion, and c. blood disease of the newborn.

(a) In the traumatic class are grouped those cases of intracranial hemorrhage which result from the prolongation of labor due to some form of dystocia, whether it be maternal, fetal or placental in origin. (It is beyond the scope of this paper to consider the details of abnormal obstetrics and the reader is referred to any modern treatise on obstetrics to acquaint himself more fully with the factors concerned in the production of pathologic labor.) Too rapid a delivery such as a spontaneous or precipitate birth is also to be included in this etiologic group since the hastened uterine expulsion prevents the fetal head from adapting itself to the tremendous forces of uterine contractions; overriding of cranial bones occurs and severe lacerations of the veins entering the sinuses or of the sinuses themselves often result in the milder cases of intracranial hemorrhage. The more serious results, such as tentorial lacerations with hemorrhage, usually terminate in death. The use of forceps is a very important consideration, although in these series of 32 bloody cases out of 300 consecutive deliveries, forceps was responsible for the intracranial vascular lesion in only 6 cases, and of 28 forceps applications, 6 intracranial hemorrhages resulted—4 being due to medium and 2 to low forceps extractions.

Ehrenfest⁷ claims that pituitrin is to be regarded as an important factor in the production of cerebral hemorrhage and he is substantiated and supported in this view by other observers—Lippman,⁸ Sidbury,⁹ Neff¹⁰ and Porter¹¹; he also believes that the various methods of resuscitation now employed are far too vigorous and hazardous for the well-being of the child that has had a difficult and abnormal entrance into the world and especially when the latent or dormant presence of an intracranial hemorrhage only too frequently exists concealed and signless; a small extravasation of blood occurring before or during birth, may easily become very markedly aggravated by many of the strenuous methods now in common practice. He is supported in this opinion by Conkey¹² who states that the vigorous methods of resuscitation should be mentioned prominently as a contributing etiologic factor in intracranial hemorrhage.

(b) Asphyxia as a cause of cerebral hemorrhage is present, not only in those cases of prolonged labor where the continued dilatation of the congested, enlarged and unsupported terminal vessels results in rupture, but also in those instances of interference with the fetal or placental circulation, such as occurs in pressure upon the umbilical cord, premature separation of the placenta, decreased placental blood supply due to an extremely contracted uterus, etc. Increased CO₂ in the blood is followed by an engorgement and an increased tension in the vessels; the delicate and unsupported venules and arterioles, unable to withstand further additional intravascular pressure, then rupture. The hemorrhage in the first two groups may occur during the process of moulding or of actual delivery itself and it may happen in the premature as well as in the mature child.

(c) Of the blood diseases as possible factors in cerebral hemorrhage of the newborn child, hemorrhagic disease of the newborn is pre-eminent and most frequent; syphilis, the toxemia of eclampsia and the so-called toxemia of pregnancy in the mother as a cause of intracranial hemorrhage in the newborn are comparatively rare. It does seem to us that hemorrhagic disease in the newborn has been overemphasized and especially so by the pathologist and by the pediatrician. In those cases where the signs of intracranial hemorrhage first make their appearance *after* the third day of life, it is very natural to consider them as being due to hemorrhagic disease of the newborn—provided the blood-clotting time is prolonged. This assumption tends to be confirmed by the findings of Rodda¹³ that the blood-coagulation time in cases of hemorrhagic disease of the newborn begins to lengthen on and after the third day, although in rare cases it may be present as early as the sixth hour. We are, however, unable to substantiate our hypothesis at present with any clinical or pathologic data, because only one of the 32 bloody cases in these series of 300 consecutive newborn babies had a lengthened coagulation time. Conkey¹² also feels that

the theory of hemorrhagic disease of the newborn as a cause has been overstressed to the exclusion of the mechanical and traumatic factors that are present in both spontaneous and operative deliveries; he further states that obstetricians should not seize upon the diagnosis as a cloak to conceal intracranial birth injuries which result from obstetrical efforts.

OBSERVATIONS

It is important that the proper terminology be used in describing these cases, so that even when quoting authors, the word "symptom" (a subjective complaint) will always be replaced by the word "sign" (an objective finding).

It is interesting to note that the signs vary from none at all to the most severe ones—depending upon the size of the hemorrhage and upon the amount of cerebral edema present. In the reports of pathologists, one is liable to be misled into believing that each case of intracranial trauma evinces such marked signs of increased intracranial pressure that if one becomes acquainted with these various signs, then a diagnosis would be a very simple matter. The pathologist is correct in so judging from the material which he receives, only the fatal cases, and the records of the signs prior to death are naturally those found in terminal conditions of large lesions with all the classical signs of increased intracranial pressure and hemorrhage; it is the obstetrician and pediatrician, examining these cases earliest, who will recognize the initial acute signs.

Capon, in his pathologic study,¹⁴ enumerates many signs, some of which occur early in the mild cases, but most of them are found in the very extensive intracranial hemorrhages and fatal cases. He has found that the normal, rosy pink color of the healthy newborn child is replaced by a bluish, asphyxial coloration, especially prominent upon the face and feet; the lips may be surrounded by a pallid zone, white rather than blue being the prevailing color in the more severe cases. In the majority of his cases, the respirations were shallow and the pulse slow and full; poor nursing and absence of the swallowing reflex were present in the severe examples; hemorrhages from the nasal and pharyngeal mucous membranes were observed. Unilateral or general spasms were also found. In the most extensive hemorrhages, nystagmus, ocular palsies, pupillary irregularities (anisocoria), convulsions, medullary and bulbar signs were observed.

This author, in a very careful pathologic study of the subject, states that the clinical signs of intracranial hemorrhage are present or develop shortly after birth. If the extravasation of blood has been large, his assumption is undoubtedly correct, but if the bleeding has been small it is our belief that no signs may be present at all—and yet the hemorrhage may be of sufficient amount to cause future cerebral impairment. If lumbar punctures had not been performed routinely in

these series, many of the signless hemorrhages and frequently the result of so-called normal, uncomplicated deliveries, would have been overlooked and the true intracranial condition would not have been recognized.

The signs, as outlined by Capon, no doubt exist in the cases of hemorrhage and cerebral edema which are severe enough to produce death; our study, however, has been a clinical one and of consecutive newborn babies—ascertaining the frequency of cerebral hemorrhage and cerebral edema of varying degrees where the signs were most frequently absent or only the faintest suspicion of their existence was present; where the lumbar puncture as a diagnostic procedure was essential and where, as a therapeutic measure, it relieved the acute condition.

Brady¹⁵ offers the classification of supra- and infratentorial hemorrhages; Towne and Faber,¹⁶ quoting Seitz, divide the cases into intraventricular, supra- and infratentorial hemorrhages. Brady bases his differentiation chiefly upon the presence of restlessness, insomnia, refusal to nurse and excessive or constant crying in supratentorial extravasations and of unusual somnolence, apathy, early cyanosis, muscular rigidity of the neck and extremities in the infratentorial cases.

Towne and Faber state that respiratory disturbance with cyanosis, generalized convulsions and rigidity of limbs indicates infratentorial bleeding, whereas unilateral convulsions or palsies, or lateral deviations of the head or eyes indicate a supratentorial lesion; the impossibility of clinically detecting intraventricular vascular trauma is mentioned.

Barnett,¹⁷ in offering the same anatomic division of intracranial hemorrhage as Towne and Faber, divides the supratentorial hemorrhages into three stages:

(a) The Initial Stage (first 24 to 48 hours) in which are noticed restlessness associated with cries of pain, refusal to nurse and sometimes respiratory difficulty, if the respiratory center has been injured or if a contusion of the brain has occurred, when the cry will be lessened and the child more quiet and pale.

(b) The Period of Cerebral Irritation: Convulsions following the signs of refusal to nurse, pallor and cephalic ery are characteristic and diagnostic; the convulsions may vary from mere twitchings to epileptiform seizures. Yawning and sighing often accompany a hemiplegia. The skin and tendon reflexes are increased. Burr,¹⁸ however, states that up to seven days of life the normal reflex response is so variable as not to be of any pathologic significance. Various and multiple eye signs are present in this stage such as ptosis, strabismus, nystagmus and anisocoria (pupillary inequalities).

(c) The Terminal Stage: Paralysis occurs in the comatose child

with no response to external stimuli; the reflexes disappear and death ensues as a result of respiratory failure or aspiration pneumonia.

Large infratentorial and intraventricular hemorrhages produce signs very similar to each other. Death results almost instantaneously from asphyxia, the patient usually being in the typical opisthotonus position with cervical rigidity and spasticity of the extremities and having had one or more generalized convulsions. This period may last as long as 24 to 48 hours.

FINDINGS

In this third series of 100 consecutive deliveries, the signs present are again of the mildest character. As determined by routine lumbar punctures within 24 to 48 hours upon these newborn babies at the City Hospital, Welfare Island, through the courtesy of Drs. Dorman and Ward, hemorrhagic and yellow cerebrospinal fluids were present in 10 per cent; bloody cerebrospinal fluids were obtained in four cases and yellow spinal fluids in six instances. (The yellow fluids will be more fully discussed later in the paper.) The signs in these cases of abnormal cerebrospinal fluids were as follows: left supranuclear facial paralysis in one case, which after the complete removal of the intracranial hemorrhage by means of lumbar drainage gradually became less marked and at the time of the patient's discharge from the hospital on the tenth day the condition had entirely disappeared. Jaundice was present in one case, twitches of the hands and feet occurred in two instances, vomiting in one, poor nursing in another, and convulsions, frothing at the mouth, cyanosis and slowed respirations in one case. In six cases where the cerebrospinal fluid varied from a yellowish tinge to amber, the signs were entirely lacking. In one case, a lumbar puncture, 17½ hours after birth, revealed clear cerebrospinal fluid under a pressure of 6 mm. Hg. (normal being 4 to 8 mm. Hg.); on the sixth day, the child became markedly jaundiced, nursed poorly and a suspicious lentic rash appeared; a lumbar puncture revealed bright yellow spinal fluid, olive oil in color and consistency, which was negative for bile. The umbilical cord blood Wassermann reaction was negative. The blood-clotting time at the initial lumbar puncture was four minutes; unfortunately, later coagulation time was not taken. It required six spinal punctures at twenty-four-hour intervals to obtain clear spinal fluid.

In seven cases, some of the signs usually found in conditions of increased intracranial pressure were observed where the cerebrospinal fluid was clear and under normal pressure, as determined by the spinal mercurial manometer and where the lumbar puncture was absolutely essential as a diagnostic procedure. Three of these cases evinced twitchings of the hands and feet; two were cyanotic and two others possessed a weak cry.

Seven mothers had 4-plus blood Wassermann reactions and only

two of the children were 4-plus, whereas the other five were negative to both antigens. (The blood of the children for the Wassermann test was obtained from the umbilical cord.) None of these seven babies born of syphilitic mothers had bloody or yellow cerebrospinal fluid and this merely corroborates the findings of our earlier series and what many other observers have stated, namely, that syphilis plays very little importance in the etiology of this condition.

Foreeps were applied in nine cases in this series; two were medium and seven were low applications. The cerebrospinal fluid obtained at lumbar puncture was blood-tinged in one and bloody in the other of the two higher operative interferences, whereas in only one case out of seven low foreeps was there blood in the cerebrospinal fluid. This

CHART II
TREATMENT OF BLOODY CASES

NOS.	NAME	COLOR	DELIVERY OR POSITION	SIGNS	PRESSURE	CLOTTING TIME	NO. OF PUNCTURES
1	L.B.	White	Med. For.	Left Supranu- clear Facial Paralysis.	8 m.m. Hg.	6 m.	3
2	F.L.	White	M. Forceps	Jaundice con- fusion Rt. Eye.	14 m.m. Hg.	5½ m.	2
3	P.L.	White	Low Forceps	T w i t c h e s Hands and Feet	15 m.m. Hg.	6½ m.	5
4	A.D.	Negro	R.O.P.	T w i t c h e s hands and feet. Nursed poorly, vom- ited.	2 m.m. Hg.	4 m.	2 3*

*Missed canal on 3 occasions. Drainage insufficient.

is in accord with our former findings, namely, that properly applied low foreeps is a small factor and of little importance in the production of intracranial hemorrhage compared with the higher extractions and that low forceps correctly applied at the end of twenty-four hours neither increases the risk nor the danger of intracranial hemorrhage any more than normal labor itself.

Six deliveries were classified by the obstetrician as precipitated labor; of these the cerebrospinal fluid in two cases was yellow, which under the microscope demonstrated many red blood corpuscles and in one case the cerebrospinal fluid was contaminated by a large hemorrhage due to a puncture of the spinal plexus of veins as was proved the following day by obtaining perfectly clear, colorless cerebrospinal fluid.

Patients in labor longer than twenty-four hours were considered cases of prolonged labor. There were two such cases in which no addi-

tional assistance, outside of Nature, was introduced to facilitate or hasten the delivery; the spinal fluid in both babies was clear. Version with breech extraction was performed in one case and no abnormalities were found in the cerebrospinal fluid. The umbilical cord around the neck was present in five cases; the lumbar puncture revealed clear cerebrospinal fluid in four of these children and in one the spinal canal was not successfully punctured. Cyanosis was present at birth in two infants and in both of these cases the cerebrospinal fluid was clear. One child was an eighth month premature baby, whose spinal fluid also was clear.

The anterior fontanelle, as in the earlier series, was in no way a diagnostic aid of the intracranial condition. Of the ten pathologic spinal fluids, the anterior fontanelles were as follows: slight bulging in one, tensely flush in three, flush but relaxed in one and depressed in five. Nor was the anterior fontanelle a reliable indicator of the intracranial pressure: in five cases, the anterior fontanelles were depressed and the intracranial pressure registered between 10 to 15 mm. Hg. by the spinal mercurial manometer; in three cases the anterior fontanelles were flush and the intracranial pressure ranged from 9 to 14 mm. Hg.; five cases were recorded as tense but flush anterior fontanelles and in these the pressures were from 4 to 14 mm. Hg.; five cases were classed as slightly bulging anterior fontanelles and the pressure readings varied from 2 to 6 mm. Hg.

The intracranial pressure of the cases where yellow or bloody spinal fluid was obtained varied as follows: 1 case 2 mm. Hg., 1 case 3 mm., 1 case 8 mm., 2 cases 10 mm., 2 cases 12 mm., 2 cases 14 mm., and 1 case 15 mm. Hg.; that is, seven out of ten cases registered increased intracranial manometric readings. There were five cases in this series where the spinal fluid was clear and a slightly increased intracranial pressure ranging from 9 to 12 mm. Hg. was present without evincing any of the mildest signs of cerebral edema. On the other hand, mild signs such as a weak cry, poor nursing, twitchings of hands and feet and cyanosis with normal cerebrospinal fluid under normal pressure of 4 to 8 mm. Hg. were observed in nine cases.

The blood-coagulation time was taken in each case and the normal index was considered to be between 5 to 8 minutes. In none of the four cases of bloody cerebrospinal fluid and only in one of the six cases of yellow spinal fluid was the blood-clotting time prolonged; in that particular instance, it was 10 minutes. In four cases with clear cerebrospinal fluids, the blood-coagulation time was lengthened, being $8\frac{1}{2}$ to 11 minutes. This together with our former observations, tends to impress us that the hemorrhagic tendency in the newborn is only of minor importance as an etiologic factor in the production of intracranial hemorrhage in the majority of instances.

YELLOW SPINAL FLUID

Yellow spinal fluid²⁰ has been known to the profession for the past 26 years when it was first described by Buseh in 1897 and it has gradually assumed more prominence and importance in the diagnosis of neurologic conditions. There are various opinions regarding the method of its production and none of the theories has met with universal acceptance. A thorough discussion of them is not possible in this paper and they are merely mentioned as follows: (1) the serogenic, (2) the hemolytic and (3) the conditions associated with jaundice. Various types of yellow spinal fluid are found depending upon the amount of coagulability, cell count and protein content. Again, the three chief groups of yellow spinal fluid with their respective characteristics may be stated as follows:

First, xanthochromic or the Froin syndrome, first described by Froin in 1903.²¹ This fluid is distinguished by its bright yellow color, rapid massive coagulation, its high albumen and fibrinogen content, which produces the clotting effect, and its increased cell count. This

CHART III.

TREATMENT OF YELLOW SPINAL FLUIDS

NOS.	NAME	COLOR	DELIVERY OR POSITION	SIGNS AND FINDINGS	PRESS.	CLOTTING TIME	NO. OF PUNCTURES
1	H.C.	White	L.O.A.	No. R.B.C.*	14 m.m. Hg.	7 m.	1
2	J.S.	White	Precipitate	Many R.B.C.	12 m.m. Hg.	3 m.	1
3	W.C.	White	L.O.A.	Many R.B.C.	3 m.m. Hg.	5½ m.	2
4	P.A.	White	L.O.A.	Convulsions, cyanosis, slowed respirations, No. R.B.C.	10 m.m. Hg.	10 m.	1
5	A.A.	White	Precipitate	Many R.B.C.	10 m.m. Hg.	7 m.	3
6	J.W.	Negro	L.O.A.	Many R.B.C.	12 m.m. Hg.	3½ m.	1

*R.B.C.—red blood corpuscles.

fluid is observed in conditions of vertebral, brain and spinal cord diseases where obstruction or interference to the cerebrospinal fluid circulation is produced. Most observers believe that this yellow fluid is a transudate of the blood plasma.

Second, erythrochromia, first described in 1916 by Hanes.²² This fluid varies in color from brownish red to deep amber and the color changes from day to day, contains red blood corpuscles or their shadows, does not clot and the tests for hemoglobin are positive. The origin is believed to be a mild transudate from the blood or due to varying degrees of hemorrhage.

Third, the Nonne syndrome.²³ This fluid may be yellow or colorless, the protein content excessive and there is no cell increase.

Besides these distinct groups, many combinations may be found.

In our present series, six yellow spinal fluids were obtained on

lumbar puncture and the color varied from amber to a very faint yellow tinge; four of these specimens contained red blood corpuscles microscopically and two did not. Unable to account for this character of fluid caused us to lose sight of the possible relationship between the fluid obtained and the erythrochromia of Hanes. Being chiefly interested in the questions of gross intradural hemorrhage, we failed to study all the properties of the cerebrospinal fluid obtained, but in the future the observations will be more careful and a detailed serology will be reported.

It is our belief that the yellow spinal fluids obtained within 48 hours after birth with or without red blood corpuscles are due to varying degrees of transudation of the blood plasma produced by venous congestion or partial asphyxia, or due to minute hemorrhages. Where red blood corpuscles were not found microscopically, it is not difficult to conceive that a fair amount of venous congestion can produce a limited transudation of the watery elements of the blood plasma without any of the cellular elements. In those instances where the congestion of the asphyxia is more pronounced or where minute hemorrhages due to lacerations of one or more venules occur, red blood corpuscles are added to the picture.

JAUNDICED CASES

Four children, whose initial lumbar puncture within twenty-seven hours after birth, revealed clear, colorless spinal fluid, became jaundiced on the 2nd, 3rd, 6th and 7th day, respectively. Repeated spinal punctures disclosed normal spinal fluid in three, and a thick, bright, yellow fluid of olive-oil consistency in one, the six-day-old baby; it was negative for bile, the other laboratory examinations being overlooked; six repeated lumbar punctures at twenty-four-hour intervals were necessary before normal, colorless cerebrospinal fluid was obtained. It must be mentioned that this particular baby had a suspicious rash which was interpreted by the pediatrician and obstetrician as possibly luetic and the child was treated with mercurial inunctions, even though the blood Wassermann reactions, both in the mother and child, were negative. The blood Wassermann reactions in the other three mothers and children were also negative.

It is interesting to note that the blood-coagulation time of two of the jaundiced children was four minutes and of the other two it was 10 and 11 minutes, respectively. The child with yellow spinal fluid, however, had a clotting time of four minutes. All these coagulation times were recorded at the initial puncture, namely, within the first twenty-seven hours and later clotting times upon the appearance of jaundice were not taken because of the absence of blood in the spinal fluid and therefore, the question of hemorrhagic disease of the newborn was not considered. It is, however, highly probable that the

case cited above where yellow spinal fluid was obtained on the sixth day of life was due to a late, mild intraeranian hemorrhage and in spite of the absence of other signs of hemorrhagic disease of the newborn, that condition should have been seriously taken into consideration.

Two of the four jaundiced cases had increased temperature, three nursed poorly, the umbilical cords of two were very much twisted, one baby was cyanotic at birth and the intraeranian pressure at lumbar puncture determined by the spinal mercurial manometer was 8 mm. Hg. in three cases and 6 mm. Hg. in the remaining one.

One jaundiced case, punctured at 71 hours of age, revealed blood-tinged spinal fluid under a pressure of 14 mm. Hg. and the clotting time was $5\frac{1}{2}$ minutes. Whether the jaundice preceded the hemorrhage or not is difficult to state, though it is more plausible, in view of the above four cases, to believe that the jaundice resulted from the absorption of the hemoglobin rather than the hemorrhage was secondary to the icterus. However, at present, it is impossible to demonstrate definitely and satisfactorily any connection between true icterus neonatorum and intraeranian hemorrhage, and further investigations of hemorrhagic spinal fluid and jaundice are necessary before final conclusions are drawn.

Formerly, when a newborn child evinced all the classical signs of an intraeranian hemorrhage, the lumbar puncture was employed more as a diagnostic aid than as a valuable therapeutic means of drainage in the early cases and it does seem to us that spinal drainage by repeated lumbar punctures upon the newborn, within the first few days of life (before the intraeranian hemorrhage has clotted) would be an additional procedure to the therapeutic armamentarium of today. It is, however, in the extremely mild cases, where only the slightest signs are present, such as an occasional muscular twitch, poor nursing, slight drowsiness, a weak cry, poor color, cyanotic tinge, or where the delivery was spontaneous or prolonged, or forceps applied and any suspicion as to a possible intraeranian injury is entertained, that early lumbar puncture should be used, in the absence of shock, not for the diagnostic benefit alone, but also for the early therapeutic value of lumbar drainage, every 12 to 24 hours and even more frequently.

TREATMENT

In the four cases having bloody cerebrospinal fluid, due to intraeranian hemorrhage, it required two, three, and five lumbar punctures, respectively, (at twenty-four-hour intervals) before clear spinal fluid was obtained. In one case where the pressure was only 2 mm. Hg., the spinal canal was successfully entered twice and unsuccessfully attempted three times more. The final result, as far as lumbar puncture drainage was concerned, was bad in this case because clear

cerebrospinal fluid was not obtained before the child was discharged. In the six cases having yellow spinal fluid, one lumbar puncture with the removal of 10 c.c. of spinal fluid was sufficient in four cases to clear up the condition so that in twenty-four hours, at the next lumbar puncture, the cerebrospinal fluid was clear and colorless; two drainage taps were required in another case and three were necessary in the last. In the one jaundiced case, detailed above, six repeated spinal punctures were required.

CHART IV.
SIGNS WITH CLEAR SPINAL FLUIDS

NOS.	NAME	DELIVERY OR POSITION	PRESS.	CLOT- TING TIME	SIGNS	COLOR	NO. DAYS AFTER BIRTH	NO. OF PUNCTURES
1	J.M.	Precipitate	6 m.m. Hg.	4 m.	Twitches of hands. Press 8	White	3	3
2	P.F.	Low Forceps	6 m.m. Hg.	8 m.	Twitches of hands. P. 6	White	4	2
3	R.M.	L.O.A. Pituitrin	6 m.m. Hg.	5 m.	Twitches of hands.	White	2	4
4	M.L.	L.O.A.	8 m.m. Hg.	8 m.	Slight twitches hands.	Negro	1	2
5	R.G.	Precipitate	2 m.m. Hg.	9 m.	Weak cry.	Negro	Same	2
6	J.A.	L.O.A.	8 m.m. Hg.	4 m.	Jaundice P. 4	Negro	1	2
7	J.M.	L.O.A.	8 m.m. Hg.	11 m.	Nursed poorly Jaundice P. 6	White	7	2
8	C.S.	R.O.R.	8 m.m. Hg.	10 m.	Nursed poorly Jaundice	White	3	3
9	T.N.	R.O.R. Prema- ture 8th mo.	3 m.m. Hg.	5 m.	Jaundice	White	2	2
10	G.D.	Not stated	6 m.m. Hg.	4 m.	Jaundice Nursed poorly	White	6	6

It is still our impression, that repeated lumbar punctures should be performed at least every 12 to 24 hours, in the absence of shock, depending upon the severity of the hemorrhage and of the cerebral edema as disclosed by the mercurial manometric readings. When this repeated spinal drainage fails to obtain clear fluid under normal pressure within a varying period of several days, then a modified subtemporal decompression and cranial drainage should be advocated *early* for fear of a resulting permanent cerebral impairment.

CONCLUSIONS

(1) The intracranial anatomy of the blood vessels in the newborn child is different from that of the adult and, therefore, more liable to injury than ordinarily conceived.

(2) The etiology of intracranial hemorrhage in the newborn falls into one of three groups, namely, trauma, congestion or asphyxia, and blood disease of the newborn.

(3) Syphilis, toxemie conditions of the mother, early low forceps applications and hemorrhagic disease of the newborn are relatively unimportant as etiologic factors in cerebral hemorrhage.

(4) Signs vary, depending upon the amount and location of the intraeranian hemorrhage and cerebral edema. Only the mildest signs have been present in this third series and the true intraeranian condition would probably have been overlooked, had the routine lumbar puncture not been performed.

(5) Ten per cent of 100 conseentive deliveries presented spinal fluids which contained evidenees of intraeranian trauma. In four cases the cerebrospinal fluid was bloody and in six eases it was yellow, in only four of which red blood corpuseles were demonstrable.

(6) The anterior fontanelle does not appear to be a reliable index of a mild increase of the intraeranian pressure.

(7) There are three main types of yellow spinal fluid: xanthochromia or the Froin Syndrome, erythrochromia as described by Hanes, and the Nonne Syndrome.

(8) Six cases in this series contained yellow spinal fluid.

(9) The yellow spinal fluid of newborn babies is very probably the result of transudation of the blood plasma when red blood corpuseles are absent, and due to minute hemorrhages when red blood corpuseles are present.

(10) Four eases of ieterus neonatorum were present in this series and only one had yellow spinal fluid.

(11) Early lumbar puncture should be employed, in the absenee of shoek, not only for its diagnostic but for its therapeutie value in early eases of cerebral hemorrhage and cerebral edema. Repeated spinal drainage at least every 12 to 24 hours is indicated, depending upon the size of the intraeranian extravasation or the amount of cerebral edema as registered by the spinal mereurial manometer.

(12) A modified subtemporal decompression and eranian drainage should be advocated only when the lumbar puncture drainage fails.

(13) Manometrie readings of intradural pressure should be taken with the spinal mereurial manometer in all suspected eases of hemorrhage in the newborn.

BIBLIOGRAPHY

- (1) *Little, W. J.*: Lancet, London, Dec. 16, 1843, i, 350; Obstet. Trans., 1862, iii, 293. (2) *McNutt, Sarah*: (1885) quoted by J. B. Sidbury. Arch. Ped., Sept., 1920, xxxvii, 545. (3) *Sharpe, Wm.*: Jour. Am. Med. Assn., August 25, 1923, lxxxi, 620-624. (4) *Sharpe, Wm., and Maclaire, A. S.*: Surg. Gynäk. and Obst., February, 1924. (5) Quoted from Monroe, and Eustice, R. S.: Am. Jour. Dis. Child, Oct., 1922, xxiv, 273. (6) *Cushing, H.*: Am. Jour. Med. Sci., 1905, cxxx, 563. (7) *Ehrenfest*: Birth Injuries of the Child. D. Appleton & Co., p. 39. (8) *Lippman, M. J.*: New York Med. Jour., Feb., 5, 1916, ciii, 268. (9) *Sidbury, J. B.*: Arch. Ped. Sept., 1920, xxxvii, 545. (10) *Neff*: quoted by Conkey, O. F. (Vide 12). (11) *Porter*: quoted by Conkey, O. F. (12) *Conkey, O. F.*: Arch. Ped., April, 1923, p. 239. (13) *Rodda, F. C.*: Illinois Med. Jour., May, 1921; Jour. Am. Med. Assn., Aug. 14, 1920, lxxi, 452. (14) *Capon, N. B.*: Jour. Obstet. and Gyn., Brit. Emp., 1922, xxix,

572-590. (15) *Brady, J. M.*: Jour. Am. Med. Assn., Aug. 3, 1918, lxxi, 347. (16) *Towne, E. B., and Faber, H. K.*: Calif. State Med. Jour., Jan., 1922. (17) *Barnett, E. J.*: Northwestern Med., Aug., 1922, xxi, 243. (18) *Burr*: quoted by Monroe and Eustice, (5). (19) *MacLaire, A. S.*: New York Med. Jour., Sept. 19, 1923. (20) *Scully, F. J.*: Arch. Neur. and Psych., July, 1923, x, 83, No. 1. (21) *Froin, G.*: Gaz. d. hôp., Paris, 1903, lxxvi, 1005. (22) *Hanes, F. M.*: Am. Jour. Med. Sci., 1916, clii, 66. (23) *Nonne*: Deutsch. Zeitsch. f. Nervenhe. 1910, xl, 161. *Nonne*: Ibid., 1913, xlix, 36.

20 WEST FIFTIETH STREET.

A STUDY OF 1352 PLACENTAE WITH REGARD TO WHITE INFARCTS*

BY F. P. McNALLEY, B.S., M.D., ST. LOUIS, MO.

(From the Department of Obstetrics, Washington University School of Medicine.)

SUCH an extensive literature has been built up on the subject of infarct formation that an explanation is due at the outset of any effort to add to the already long list of papers. In spite of the enormous amount of painstaking investigation that has been carried out by careful observers, there still seems to be no generally accepted views as to the origin of white infarcts. At the beginning of this study an attempt to learn about white infarcts from the writings of men whose opinion must bear some weight only served to confuse. It hardly seemed possible that such careful observers were wrong and yet their conclusions did not coincide. After the careful and complete macro- and microscopic study of 1352 placentae, I have come to some conclusions which make it possible to correlate some of the correct, but apparently different views. It is not my intention to attempt an exhaustive review of the literature because nothing could be gained since this has been done previously, notably by Williams.

Early in this study it became evident that no one theory could account for all the white infarcts. This term is used in the sense in which it is ordinarily applied, i.e., meaning those structures which are white in color, firm in consistency, and occur in any portion of the placenta. It will be seen that, strictly speaking in a pathologic way, it is improper when applied to certain structures, yet it would be inadvisable to attempt to change a terminology that is so familiar to everyone. White infarcts can be roughly divided into three types: (1) those replacing collections of blood; (2) those developing from red infarcts as described by Young, and (3) the senile changes which have been described by Eden and Williams.

Areas are frequently seen answering the gross description of white infarcts, but which, on microscopic examination show no villi. These seem to be identical with what Williams calls the final stage of the

*Read before the St. Louis Gynecological Society, February 8, 1924.

infarct, for he says, "The fibrinous infarcts, which we observe in their most fully developed form in the substance of the placenta, represent the final stage of the process. In the majority of cases, however, this is not the form of infarct which we observe, for usually we meet with less developed varieties which consist of a mass of fibrin in which are imbedded numbers of more or less well preserved villi." It would seem, however, that these fibrinous areas differ in origin from the ordinary infarct as has been pointed out in detail in a previous paper, so suffice it to say here that they are merely masses of fibrin which have been laid down in and replace a previous collection of blood. We have been able to trace this process step by step from the original hematoma to the solid mass of fibrin which is formed in the same way as a laminated clot.

In a previous paper I stated that these collections of blood were probably maternal and now I am convinced that this is a fact, and that they result from back pressure due to venous stasis as a result of changes in the maternal veins. Hitschmann and Lindenthal have pointed out that there is a slowing of the blood stream in intervillous spaces due to the fact that the blood flows into these relatively large spaces from the small maternal vessels, just as there is a slowing of the current when a stream flows into a larger body of water. This is further exaggerated by the back pressure making conditions ideal for fibrin formation just as in any thrombus.

Further studies since the original paper have confirmed these observations. Similar lesions have been observed by earlier writers except that they used the terms "fibrous" and "organization." This would mean granulation tissue such as occurs in ordinary wound repair and which never occurs in the placenta. I quote these views from Williams' article, "and Cruveilhier, in his article upon apoplexy of the placenta, stated that he had observed a complete series of cases which demonstrated the transformation of the ordinary apoplexy into pale white fibrous areas. This doctrine was enthusiastically championed by Jacquemier in 1839, and his views were accepted in their entirety by Gierse and Meckel, Klebs, Valenta, and many others and have not been completely forsaken, even at the present time. Thus we find that Shaffer considers that many of the subchorial infarcts are the result of localized hemorrhages."

We believe that all white infarcts on the fetal surface, i.e., subchorial infarcts, belong to this class. This conversion of blood to solid fibrin can occur in any location, whether it be subchorial, intraplacental, or retroplacental. Since the term "infarct" means death of tissue it is evident that it is not descriptive of these areas; however, we cannot suggest one that is, but if their etiology is kept in mind no confusion should result.

So far as other white infarcts are concerned, there are three outstanding views: First, that they are due to changes in the fetal vessels upheld principally by Eden and Williams; second, that they are due to an interference with the maternal circulation upheld principally among modern writers by Young, and third, that they are due to changes in the syncytium as pointed out by Hitschmann and Lindenthal.

It is our belief that all these views are correct in a measure. Roughly, there are two types: First, microscopic or small macroscopic infarcts involving isolated villi or small groups of villi, or the so-called decidual islands seen in every placenta; and second, the larger infarcts, always visible to the naked eye and sometimes occupying large portions of the placenta and frequently associated with toxemias.

The studies of Eden and Williams on the one hand, and they agree on all important points, and of Young on the other, have been so complete and accurate that there is very little to add.

It is self-evident that if any infarction is to take place there must be an interference with the blood supply of the infarcted areas, so the question arises—upon what blood supply do the villi depend? This, Young has answered correctly when he says maternal, and his reasons cannot be contradicted.

(1) "The time when the chorionic elements are most active and proliferate most rapidly is during the early stages of the development of the ovum, where there are, as yet, no fetal vessels formed, and where the trophoblast and its villi live directly upon the mother's blood."

(2) "In hydatid mole the chorionic villi live and, as we know, actively proliferate, when there is no trace of a fetal vessel and when the entire nourishment is derived from the blood of the mother." Hitschmann also cites this as proof and Williams states in his chapter on hydatidiform mole "as the chorionic villi are nourished by the maternal blood the mole may continue to grow after the death of the fetus."

(3) "In tubal pregnancy one can sometimes recognize the independence of the villi of the fetal blood in a diagrammatic manner. Where there has been a considerable hemorrhage into the intrachorionic space great masses of villi become strangled in blood clot. I have seen one such case where all the trunks in the neighborhood of the chorion have undergone fibrinous necrosis, but near the tube wall where, in parts, the maternal circulation was unimpaired, the tips of the necrotic villi remained healthy."

To these reasons might be added several others. In a syphilitic placenta when the fetal vessels are very few and in many cases absent, little if any more infarction is seen than in a normal placenta. The development of the discoid placenta at term from the early chorion seems to be dependent on the maternal supply. Early in pregnancy when the ovum is imbedded in the decidua and surrounded by the maternal vessels, the growth of the villi is equal about the entire periphery. However when due to an increase in size, the decidua

reflexa is lifted up and thinned out, decreasing the maternal blood supply; the adjacent villi degenerate, while those in contact with the basalis, and hence a good blood supply, continue to develop with the formation of the placenta. Hitschmann and Lindenthal point out the well-known fact that whole villi may be entirely separated from the placenta and enter the maternal veins where they are transported for varying distances and maintain their structure unchanged.

These reasons having proved, as we believe, that the villi are nourished by the maternal blood, it remains only to show that interference with the maternal supply does take place in order to demonstrate the etiology of infarction. This interference may be either arterial or venous. If arterial, an anemia of the dependent area takes place. This was recognized by Eden and given by him as the explanation for the cause of his "nonfibrinous infarcts," which are identical to those described by Young. Goodall, in describing vessel changes in a uterus forty-four hours postpartum of a patient dying of eclampsia, mentions the complete obliteration or narrowing of the caliber of the arteries and feels that these changes must have taken days for their development, or, in other words, occurred before delivery, and mentions the association of these marked changes with infarcts. Schwarz and McNalley, in a recent paper, have shown that these arterial changes are present before labor and particularly marked in toxemic cases associated with infarcts.

If the interference be venous there will result a stagnation of blood and if the back pressure is sufficient an extravasation resulting in the intra- or retro-placental hematoma will take place, the result is the depriving of the adjacent villi of their nourishment. It is known that thrombosis of decidual veins occurs before delivery as does obliteration of veins in the uterine wall, as has been shown by Goodall and confirmed by Schwarz and McNalley. Interference with the maternal supply also occurs when there is a premature separation of the placenta or a deposition of fibrin about the villi as will be pointed out later.

The idea that interference with the maternal circulation is the basis for infarction had been expressed by older writers as brought out by Williams in his monograph. Thus, "Cruveilhier designated the condition as atrophy, and believed that it resulted from the separation of the placenta from the underlying decidua, whereby the maternal vessels were lacerated and anemia of larger or smaller areas of the placenta resulted." Also to quote further from Williams, "A certain number of observers have also thought that they could find the primary cause of the disease in changes in the maternal vessels of the decidua, which resulted in thrombosis and subsequent interference with the circulation in larger or smaller portions of the

placenta. Such views were held by Rossur and Rohn, and in a modified way by Rebemont-Dessaignes."

The second type of infaret, i.e., that originating as a red infaret, is the result of either arterial or venous obstruction, as pointed out above. The changes through which the placental tissue passes to form white infarets have been so accurately described by Young that we can do no better than quote directly from his article. We might say here that so far as infarction is concerned, we have, in the study of our large material, confirmed his work absolutely. We have many times found specimens almost identical with his illustrations and feel sure that any one who will take the trouble can demonstrate all the changes which he describes.

(1) "In the earliest stage recognizable to the naked eye the patch is deep red, purple or even black. It may not be visible until thrown into relief against the surrounding paler placenta which has lain for some days in the fixing solution, into which the unclotted blood in the intervillous spaces has oozed. The patch stands out distinctly and is sharply cut off from the surrounding healthy placenta."

(2) "In this stage the color becomes lighter. The dark red or purple becomes dusky brown, chocolate colored or brick-red. The spongy character of the normal placental tissues has disappeared and the patch cuts solid, the section showing a smooth surface all over."

(3) "In the older infarets the color becomes progressively lighter. The dark brown of the preceding stage becomes light brown, yellow and then, sometimes, pure white."

"That such a description of infarets is the true one is proved by the fact that one can find, often in the same placenta, all the various stages between the earliest (purple), and the latest (white) stages."

"What is the explanation of these changing colors? . . . The first explanation that suggests itself is that it is associated with an alteration in the blood contained within the affected portion. To begin with, the villi are engorged throughout, the thin-walled capillaries in the smaller villi and the thicker vessels in the larger villi are greatly expanded and are tightly packed with blood cells. In the small villi the vessel expansion may be so extreme that the stroma has become displaced to the periphery and there intervenes between the blood in the villi and that in the intervillous spaces only a very thin sheet of tissue. The purple color of the fresh infaret is therefore due to the villi being turgid with poorly oxygenated blood. In the later stages the blood within the villi, and any blood present within the intervillous regions, becomes paler and paler, the hemoglobin becomes completely removed and nothing but the shadowy outlines of the corpuscles are seen. These stages correspond to the later stages of the infarction and demonstrate readily the meaning of the phases presented by the changing nodules."

As we pointed out in our previous paper it is only the early stages of this type of infaret to which the term "red infaret" should be applied, because it is the only condition occurring in the placenta that is both an infaret and red.

Of course, coincident with the changes in the blood described above, the deposit of fibrin about the villi and the coagulation, necrosis of the villus which has been described by other authors occurs so that in the complete infaret only the bare outlines of the villi remain,

but in any infarct in which the villi play a part their outlines can be seen. If they are not visible, i.e., if the area consists of only a mass of fibrin, the origin was a collection of blood.

In practically all macroscopic infarcts and in all that were of any size, we have been able to satisfy ourselves that they developed as described by Young. This is particularly true in those associated with the toxemias. We are not prepared to agree with Young that they are the cause of toxemia, although we do not deny that this may be possible. In these cases we have found them in all stages from red to white. Thus out of thirty-six toxemic cases, nineteen were definitely of the nephritic type, of these, fourteen were normal, two had white infarcts and three had red infarcts; eleven were probably of the preeclamptic type, of these, four had white infarcts, two had red infarcts, five were normal and one had a retroplacental hematoma; six cases were eclamptic, four of which had red infarcts, one had white infarcts and one was normal. This does not consider the collections of blood improperly called red infarcts which, as we pointed out in our previous paper, are found in normal cases just as well as in toxemic cases.

In the cases where there has been separation of the placenta and delivery was not immediate, we have found the adjacent tissue in various stages of infarction, from red to white, depending on whether delivery occurred relatively soon or late after the separation. The infarction surrounding collections of blood in the placenta sufficiently large to interfere with the circulation have always answered Young's description. This is true of the large white infarcts on the fetal surface, the major portion being made up of fibrin from a collection of blood.

We feel, however, that Young's explanation will not, by any means explain all the structures seen in the placenta which have the appearance of necrotic tissue and to which the term "white infarct" is applied. We refer to the changes that are seen in every placenta and are without pathologic significance in contradistinction to those already described which are the kind, if any, that are associated with the toxemias of pregnancy, uteroplacenta apoplexy, etc.

These nonpathologic infarcts are the ones that have been so accurately described by Eden and Williams. They are found in every placenta and Eden, with whom we agree, believes that they are the manifestation of senility of the organ. His description of these changes is so accurate that we take the liberty to quote rather extensively from his article.

"The placenta is, in short, a caducous organ. Now, all caducous organs begin to degenerate for an appreciable time before they are cast off by the individual, plant or animal, to which they belong. So the ripe placenta is a worn-out, senile structure. This failure of vitality in the placenta commences long before the ap-

proach of term, and results in certain structural alterations. The degenerations in the ripe placenta have been freely interpreted as evidence of disease. This is a serious matter, and obviously a great hindrance to the study of the pathology of the placenta. The change affects chiefly the intima (endarteritis), with some participation of the adventitia (periarteritis). The first indication of the process consists of an increase in the density and thickness of the adventitia. Almost at the same time the intima becomes affected. The subendothelial cells proliferate irregularly, either forming localized bulgings, which encroach upon the lumen, or affecting the whole circumference; or confined to one side, giving rise to the characteristic signet ring appearance of endarteritis obliterans. As a rule the endothelium is lost at this stage. In an artery thus affected the obstruction is often completed by thrombosis, or, in other cases, the lumen may disappear by thickening of the intima. Arteries showing these changes may be found in every ripe placenta; they are most numerous in the marginal cotyledons and become progressively fewer towards the center, but the number of branches affected is relatively small. The changes appear to be slowly progressive during the last three months of pregnancy."

"There are no facts, of which I am aware, bearing upon the etiology of these changes. Certainly, the fetus takes decided measures to cut itself off from its placenta during the last weeks of intrauterine life, and it seems probable that the process must be referred to the natural forces of evolution and decay."

"The first structure which appears to suffer from this progressive diminution of the blood supply to the villi is their epithelial covering. Indeed, such marked changes occur that the chorionic epithelium at term presents quite a different appearance from that of the young and growing placenta."

We might say here that, while we agree so far as the characters of these changes in the syneytium are concerned, we do not believe, in face of the evidence, that the villi are dependent upon the maternal circulation; that they can be considered as a result of the arterial changes but are rather independent of them, and probably are also an expression of senility.

To quote further from Eden:

"It will be remembered that in the young placenta the chorionic epithelium consists of two layers, a superficial layer of nucleated protoplasm, and a deep layer of well-defined cells. In the ripe placenta the deep layer has almost disappeared, being merely represented by scattered clusters of nuclei beneath the plasmodial layer. The plasmodial layer itself is very unequal. In some villi buds and processes are still to be seen, although the development of the buds into new villi by the process of vascularization is never observed. Again, many villi show, in places, complete atrophy of the plasmodium, the nuclei having disappeared and nothing remaining but a thin structureless line. As a result of the atrophy of the plasmodium, underlying capillaries may be directly exposed to the maternal blood in the intervillous spaces. In addition to these changes the chorionic epithelium undergoes a peculiar form of degeneration. A change occurs in the protoplasm of the plasmodium and of the remains of the cellular layer, resulting in the formation of an opaque fibrillated material, staining with the ordinary reagents much more deeply than the affected parts. The change is irregular in distribution and frequently extends to the cells underlying the plasmodium. Buds are affected in the same manner, but the stroma of the villi appears never to be involved. The new material possesses many of the staining reactions characteristic of fibrin, and the process is therefore generally spoken of as 'fibrinous degeneration.' But it also

possesses many affinities with hyaline material, and its exact nature is open to doubt. It probably results from a process allied to coagulation-neerosis. Upon the degenerated areas fibrin is now deposited from the maternal blood in the intervillous spaces and often considerable heaps of this material are found. Owing to the similarity of their staining reactions it is often difficult to say where the fibrin ends and the degenerated epithelium begins."

This deposition of fibrin can be easily understood when we remember that the syncytium, lining as it does the intervillous spaces, plays the part of the endothelium lining ordinary blood vessels and in the same way permits the circulation of blood without coagulation. We know that injury to the normal lining of a vessel will result in the formation of a thrombus and in the same way injury to the syncytium will result in the same thing. This has been brought out by Hitschmann and Lindenthal. We believe that this is the cause for the formation of the type of infarcts described by Eden and Williams.

As has been stated, there is indisputable evidence that the villi are dependent upon the maternal blood for their nourishment and while we agree that the vessel changes described occur we do not believe that they are causative in the production of the infarcts, but rather that the associated degeneration of the syncytium (the endothelium of the intervillous spaces) causes the deposition of fibrin around the villus and hence cuts it off from its source of nourishment, the maternal blood, with the result that it undergoes the same change which takes place in any infarct.

There remains one other type of infarct which is seen in all placenta at term, i.e., that in association with so-called decidual islands or septa. We use the words "so-called" because there is a difference of opinion as to whether they are fetal or maternal in origin. It is our belief that they are decidua because many times they have been observed extending from the basalis almost to the chorion. The cells have definite cell boundaries, so if they were fetal they would have to be Langhan's cells, which we know disappear long before term. It is not unreasonable to believe that the villi in digesting its way into the compact layer would leave some parts undestroyed which would remain as septa or islands. However, for the purpose of explaining the associated infarction their origin is of no importance.

It is generally agreed that degeneration of these cells does take place, giving the appearance of fibrin and followed by deposition of fibrin from the maternal blood. If this increases to the extent that it surrounds the adjacent villi, their nourishment will be cut off and they will undergo infarction. This accounts for the frequent infarcts which are made up of degenerated so-called decidual islands, plus villi, all imbedded in a mess of fibrin. We believe, with Eden, that the degeneration of these islands represents a senile change seen in every placenta.

CONCLUSIONS

White infarets may be roughly grouped into three classes. First: Areas which have the appearance of a white infaret but which are merely masses of fibrin which have replaced a previous collection of blood. They are not true infarets in a pathologic sense, but in the absence of a better one this term is applied to them since they have the gross appearance of a white infaret as it is usually understood. All the white infarets on the fetal surface belong to this class, as do many of the intraplacental and some of those seen on the maternal surface. These are not formed by a process of organization but merely by laying down of fibrin as in a laminated clot.

The other two classes of infarets are dependent on the fact that villi derive their nourishment from the maternal circulation.

The second type, that described by Young, is red to begin with and becomes white by the process which he has described. These are the only abnormalities found which should be called red infarets. To this class belong all the large infarets and almost all of those that are visible to the naked eye. These are the ones, if any, that are associated with toxemias.

The third class are those so ably described by Williams and Eden and represent senile changes. Our only point of difference is that the senile changes of the syneytium (the endothelium of the maternal sinuses) as pointed out by Hitschmann and Lindenthal, which occur along with those in the vessels result in the deposition of fibrin about the periphery and hence cuts off the blood supply with the resulting necrosis. This is the same process as occurs when the endothelium of any vessel is injured. To this type belong the microscopic infarets seen in every placenta and a few of the larger ones, particularly those at the periphery of the placenta.

BIBLIOGRAPHY

Eden: British Jour. of Path. and Bacteriol., 1897, iv, 265. *Hitschmann and Lindenthal*: Archiv. f. Gynäk., 1903, lxxix, 587. *Williams*: Am. Jour. of Obstet., 1900, xli, 775. *Young*: Jour. Obstet. and Gyn., British Empire, 1914, xxvi, 1. *Goodall*: Studies from the Royal Victoria Hospital, Montreal, ii, No. 3. *Schwarz & McNalley*: AM. JOUR. OF OBST. AND GYNEC., 1923, vi, 155. *McNalley & Dieckmann*: AM. JOUR. OBST. & GYNEC., 1923, v, 55.

503 WALL BLDG.

INCONTINENCE OF URINE DUE TO RELAXED VESICAL SPHINCTER*

BY H. DAWSON FURNISS, M.D., F.A.C.S., NEW YORK, N. Y.

INCONTINENCE of urine due to relaxed vesical sphincter is most often seen in those who have borne children, occasionally after an abdominal operation, such as hysterectomy, and rarely, in the nulliparous woman who has never had an operation.

When it occurs in the parous woman, the incontinence may be noted immediately after labor, although it is not often apparent until after the lying-in period, and the degree of incontinence is in proportion to the dystocia. The majority that I have seen have started several years after labor, and generally after the woman is past thirty-five. Occasionally this form of incontinence is found in the unmarried woman coming on about the time of the menopause or later.

It is difficult to determine whether the relaxation is due to disturbance of nerve control, muscle weakness, direct muscle injury, or loosening of the attachments of the sphincter. In the nullipara who has never had an operation, we must assume that the lack of control is due to nerve disturbance or progressive muscular weakness. Occasionally an illness associated with strenuous coughing, as influenza, bronchitis, or pneumonia, may cause or hasten a developing incontinence. The condition usually starts as a slight leakage on sneezing, coughing, lifting, etc., becoming gradually more marked; or following operation or labor there may be a complete incontinence, even when lying down.

I have arbitrarily divided the cases into four classes:

- (1) Mild: Slight—occasional leakage on straining—as when coughing, sneezing, etc. The leakage in this class is more apt to occur when the bladder is full.
- (2) Moderate: Moderate leakage on exertion, or straining.
- (3) Marked: Total inability to retain urine in the erect posture.
- (4) Complete: Complete incontinence, erect or lying.

The diagnosis is made from the history and the physical examination. Often, especially in the clinic class of patients, it is difficult to determine whether their statement regarding inability to hold urine refers to marked frequency and urgency, or incontinence, and can only be found out by very careful questioning. If the clothes are never wet, the inference is marked frequency and not incontinence.

In examining the patient, we have her strain when the bladder is full, and observe whether or not there is leakage. If none is apparent in the lying posture, the patient is examined standing. The

*Read at a meeting of the Obstetric Section, New York Academy of Medicine, January 22, 1924.

urethral orifice itself should be observed, for at times there is incontinence on straining with vesicovaginal fistula, or a fluid collected in the vagina from a ureterovaginal fistula is expelled.

The instrumental examination consists in excluding vesicovaginal and uterovaginal fistulae, supernumerary ureters, and an examination of the sphincter itself. In most of these patients very little resistance is felt to the passage of instruments through the urethra. To determine the tonicity of the sphincter, we observe how promptly and how tightly it closes over the end of a tubular cystoscope of the Kelly, Farrar, or Geringer type. In normal patients there is an immediate contraction of the sphincter as the instrument is withdrawn, but with relaxed sphincter, the closure is sluggish and it often remains open after the distal end of the instrument has been withdrawn into the urethra. This is particularly noticeable when using the water-filled type of urethroscope.

Treatment.—For some of the milder degrees of incontinence, especially when associated with urethritis and trigonitis, applications of silver nitrate are beneficial, though frequently disappointing. An Albert Smith or a Hodge pessary, or a lamb's wool tampon, will often give the little support necessary to prevent leakage, and may act as an efficient palliative. Galvanism, or faradism, of the urethra, with the one electrode in the urethra, and the large, indifferent one over the sacrum, has at times been beneficial, according to Somerville (*British Medical Journal*, August 25, 1923).

All kinds of operations have been advocated. Twisting of the urethra through 180 degrees after dissecting it free (Gersuny); advancement of the urethra, so that it is stretched and angulated under the symphysis pubis (Dudley); injection of paraffin around the sphincter; dissection of the pyramidalis muscles, passing them down under the symphysis and around the urethra (Stoeckel); the same procedure using the inner edges of the levator ani; have all been tried with more or less success. Hugh Young has reported success in shortening the posterior portion of the sphincter, after suprapubic cystotomy. It has the double disadvantage of requiring an incision through the vesical mucosa over the sphincter, and an opening into the bladder.

Regarding the aforementioned operations, I assisted in the performance of a Dudley after the failure of a Gersuny, and it was a likewise failure. I saw Dr. Robert T. Morris do a Gersuny that was entirely satisfactory for ten years; there has been a slight incontinence during the past six months.

My operative work on these cases began at the time Dr. Kelly first described his operation, and I have followed his technique very closely, except that I use number two, ten-day, chromic catgut for the deep sutures, instead of linen.

Briefly stated, the operation consists in exposing the anterior vaginal

wall by posterior wall retraction, with the patient in the lithotomy position, incision in the midline from just back of the urethra, almost to the cervix. The vaginal wall is then dissected from the bladder sufficiently to show up the sphincter, which is a poorly defined structure. To determine its situation, a Pezzer catheter is inserted in the bladder. By gentle traction on the catheter, with one finger against the anterior vaginal wall, the sphincter is located as the structure just anterior to the mushroom part of the catheter where it meets resistance on withdrawal. It is essential to determine accurately the location of the sphincter to insure a good result, and to prevent ureteral injuries. Two tiers of two mattress stitches each are so placed that the sphincter is enfolded against the floor of the urethra and narrowed from side to side. No undue tension should be used, or sloughing may result. The redundant anterior vaginal wall is resected, and the wound closed with interrupted chromic catgut stitches.

I have at times combined this operation with a Watkins interposition operation in marked cystocele. We have all seen patients relieved of incontinence by the interposition operation, and one might feel that it would be sufficient, but I do not think it safe to rely on this alone.

In patients with senile atrophy of the vagina, and in elderly nulliparae, it is advisable and at times absolutely necessary to make a deep pararectal incision through the perineum to get adequate working room. Often the senile changes make the separation of the vaginal mucosa from the bladder difficult, and great care is necessary not to tear the vaginal flaps.

About two months ago I operated from above on a relaxed sphincter, obtaining an entirely satisfactory result, and very recently have done a second case. The operation is easily performed and has some good points over the Kelly procedure. In addition to narrowing the sphincter, the urethra should be brought forward in the instances where there has been a descent due to labor. This is readily accomplished by leaving long both ends of one of the more superficial sutures in the sphincter and anchoring them to the fascia of the abdominal incision.

I believe the suprapubic operation indicated where, in addition to the repair of a relaxed sphincter, abdominal work needs to be done through a low median incision; in elderly nulliparae; where previous vaginal operations make sphincter exposure difficult; where the Kelly operation has not been successful; and where there is marked senile atrophy of the vaginal mucosa.

My operative experience consists of twenty-one cases, in eighteen of which the Kelly technic was used, and three the suprapubic technic, divided into the four groups previously mentioned. The results were as follows:

(1) There were none of the mild cases.

(2) Of the moderate class eight, six successful, and two not heard from.

(3) Of the nine in the marked class, there is no report on two, one was a failure, one a partial success, and five very satisfactory.

(4) Of four with complete incontinence, one was a failure, one moderately benefited, and the other two were gratifying successes. One of the latter had, in addition to the sphincter lesion, a urethrovaginal fistula, due to a very difficult forceps delivery. The slightly benefited one had had four previous operations.

An analysis of the results of this operation gives a gratifying degree of success.

54 EAST FORTY-EIGHTH STREET.

INTERNAL MIGRATION OF THE OVUM IN THE GUINEA PIG

BY PAUL B. KINNEY, M.D., STANFORD UNIVERSITY, CAL.

(From the Department of Anatomy, Stanford University.)

THE purpose of this investigation was to determine whether internal migration of ova occurs in the guinea pig and, if so, to learn in what ratio this phenomenon takes place. It was decided that the most certain method of arriving at a definite conclusion would be to remove one ovary. By mating these operated pigs and examining the pregnant uteri, a definite conclusion could be reached regarding the problem. The presence in a single guinea pig of an implantation in the horn from which the ovary had been removed would be conclusive evidence that internal migration had occurred. Negative results could be conclusive only if a large series of experiments was made.

Corner (1921), working with the domestic pig, investigated the problem of internal migration of the ova, by noting the position of implantations in the uterus; and by correlating the number of implantations in one horn with the number of corpora lutea found in the corresponding ovary. This method is unreliable, however, because of the possible rapid retrogression of a corpus luteum, the possible failure of a corpus luteum to form, because of the occurrence of polyovular follicles, or of single ovum twins.

It was found that the simplest method of reaching the ovary is to make a dorsal incision 1 cm. long just at the lower pole of the kidney. The reflection of the peritoneum makes it difficult to remove the ovary without cutting into the peritoneal sac but as soon as the peritoneum was incised, the ovary protruded through the opening. It could then be easily picked up and the oviduct and vessels ligated as near as possible to the ovary. The peritoneum and muscle layer

were then sewn together. A single stitche was usually suffieient to close these layers. The skin was closed with two stiches, the operation lasting less than fifteen minutes.

When the pigs had fully recovered from the operation they were mated; and when pregnaney had lasted twenty to twenty-five days, they were killed, and the uterus examined. At the present time, I have killed nineteen pregnant guinea pigs. As nearly as could be judged from gross examination, the tube from which the ovary had been removed was normal in each case. The size and color compared very favorably with that of a normal uterus. The adhesions were slight in all of the cases, being present only at the extreme distal end and in no case was there any apparent constriction of the oviduct.

In none of these pigs could I find any evidence of migration of the ova. The implantations were all in the horn having the ovary intact.

TABLE I

NO. OF PIG	OVARY REMOVED	IMPLANTATIONS RIGHT TUBE	IMPLANTATIONS LEFT TUBE	TOTAL IMPLANTATIONS
73	right	0	3	3
76	"	0	1	1
322	"	0	2	2
60	left	3	0	3
344	right	0	3	3
81	"	0	3	3
66	"	0	1	1
82*	"	0	4	4
77	"	0	3	3
1	right	0	1	1
2	"	0	3	3
3	"	0	3	3
4	"	0	3	3
5	"	0	3	3
6	"	0	3	3
7	"	0	3	3
8	"	0	2	2
9	"	0	3	3
10	"	0	3	3

*At autopsy of Pig No. 82, it was found that the right horn was atrophic. It appeared very small in diameter and pale in color but patent and hence was included.

The implantations appeared normal but the number of conceptusses does not seem to have been materially reduced by the removal of an ovary, for the average litter in our stock according to Draper (1920) and Tresidder (1922) is three, while the average litter from operated pigs is 2.7. This result is in entire agreement with the findings of Doncaster and Marshall (1910), King (1911), and Arai (1921), on rats, and of Hartman (1923) in the opossum. Since the response of the remaining ovary is so prompt it also suggests that it would be due to rapid maturation of more ova and that only a pseudo- and not a true hypertrophy occurs under these conditions. The increase in size of the remaining ovary no doubt is due largely if not wholly

to an increase in the number of rapidly maturing Graafian follicles and to the subsequent increase in the number of corpora lutea as concluded by Arai.

While the series reported here is very small, the results are unequivocal and suggest that if internal migration of ova does take place in the guinea pig, it does not take place in any such ratio as one to three as Corner (1921) concluded was the case in the domestic pig. The table shows that in thirteen of the nineteen cases reported, there were at least three implantations in one horn and none in the other. If a power of distribution of ova were possessed by the guinea pig, it should have manifested itself in instances in which this number of implantations was found in one tube. This should particularly be the case since one conceptus out of three implanted in one horn, not infrequently dies and is absorbed.

Corner cited one case in the domestic pig, No. 112, in which there were five corpora lutea in the left ovary and two in the right. The left tube of the uterus showed three implantations and the right tube four, suggesting that two of the fetuses in the right tube must have come from the left ovary. Because of the rapid retrogression of corpora lutea when pregnancy does not follow, Corner believed that there is no danger of confusing corpora of different ovulations, and never observed failure of corpora lutea to develop. He found polyovular ova but they were rare, and, in his opinion, could not account for the appearance of migration in one out of every three pregnancies.

Andrews (1912-13) reported a case of interstitial pregnancy on the right side, that could be removed without opening the uterine cavity, with a normally implanted twin embryo in the right cornu of the uterine cavity, in a woman whose right tube and ovary had been removed. This would seem to be an authentic case of internal migration of the ovum in the human uterus, and a careful survey of clinical records might disclose similar cases of internal migration in women. However, Williams, in discussing the case of Coe (1893), believed it to be one of external rather than of internal migration, thus throwing doubt upon Coe's case. Moreover, in view of the totally different anatomic conditions in man the occurrence of internal migration in women would offer no proof of its occurrence in bicornuate uteri.

REFERENCES

- (1) *Andrews, H. R.*: Proc. Royal Society of Medicine, Obst. and Gyn. Section, London, 52-53, 1912-13. (2) *Arai, Hayato*: Am. Jour. Anat., 1921, xxviii. (3) *Coe, Henry C.*: Gynecological Trans., 1893, xviii. (4) *Corner, Geo. W.*: Johns Hopkins Hospital Bulletin, 1921, xxxii. (5) *Doncaster, J. and Marshall, F. H. A.*: Jour. Genetics, 1910, i. (6) *Draper, R. L.*: Anatomical Record, May, 1920, xviii, No. 4. (7) *Hartman, Carl*: Smithsonian Reports, Washington, D. C., 1921. (8) *King, H. D.*: Jour. Exp. Zool., 1911, x. (9) *Tresidder, Donald B.*: Am. Nat., 1922, lvi. (10) *Williams, J. Whitridge*—(See discussion on Coe's paper.)

THE CONTRAINDICATIONS TO RADIUM IN THE TREATMENT OF DISEASES OF THE FEMALE PELVIS*

BY F. E. KEENE, M.D., PHILADELPHIA, PA.

(*Department of Gynecology, University of Pennsylvania.*)

THREE requisites are essential to successful radiotherapy in diseases of the female pelvis, viz., the skilled diagnostician, the competent gynecologic pathologist, and the sane radiologist. In the treatment of any large series of cases, the absence of either of these will result in failures or even disasters which could otherwise have been avoided. The day is past when radium is available only in large institutions, where these requisites are met and, as a consequence, it is often used unwisely, without the proper appreciation of its indications, contraindications and dangers. Therefore, when your President requested me to present a paper dealing with the dangers or contraindications to radium, I accepted with pleasure, hoping the discussion of my remarks by this body of experienced men might be far-reaching in its effects by way of emphasizing the limitations to this form of treatment.

Because of my association with Doctor J. G. Clark in the Gynecological Clinic of the University of Pennsylvania, it has been my good fortune to be able to follow a large series of cases since the use of radium was started about twelve years ago. From these observations, two facts stand out preeminently: one, that in properly selected cases, the advent of radium marks a great epoch of advance in the realm of gynecologic therapeutics and has proved a boon and indeed a life-saving measure in many instances; the other and no less important fact is that a sharp dividing line exists in the types of cases suitable for irradiation or operation, the proper selection of the one or the other depending upon an intelligent conception of the pathology at hand as well as an adequate appreciation of the relative merits and disadvantages of each in the treatment of any given lesion. Such a decision can be made only by the gynecologist who is experienced in both forms of treatment; the indiscriminate use of radium or the x-ray by those inexperienced in gynecology and the rental of radium or its emanations without most careful supervision of the lesions to be treated must inevitably be followed by dire consequences. Examples of these misdirected efforts have repeatedly come under our observation and, as a consequence, not only much discredit has fallen upon radium but, what is more important, actual harm has been done to the patients.

*Read at a meeting of the New York Obstetrical Society, February 12, 1924.

With these preliminary general remarks let us pass to the contraindications to irradiation as we see them. Being among the first in this country to use radium extensively we have felt our way cautiously, making a careful survey of our cases at frequent intervals; the contraindications as I shall present them are based entirely upon the knowledge gained from such observations and a strict adherence to these restrictions has given us results which have been eminently satisfactory.

My remarks have to deal largely with the treatment of benign lesions. Discussion of the relative value of irradiation, operation or a combination of the two in cancer of the cervix is not in the province of this paper. Suffice it to say that in the very early lesions, we believe that operation supplemented by irradiation is the method of choice. During our earlier work, every case of carcinoma of the cervix was treated with radium, irrespective of the extent or duration of the disease. We now believe such a course is unwise in that with certain types of lesions, even palliation cannot be hoped for; on the contrary, irradiation may add suffering to the patient's already miserable existence. Into this category fall particularly those cases showing extension to the bladder base and rectum or wide parametrial or uterosacral involvement. The occasional brilliant result obtained in even the very advanced cases might argue against their rejection but such an argument falls in a review of a large series. What a combination of radium and the modern deep x-ray therapy offers in such cases is still open to question. While only the early lesions of cervical cancer are operated upon, the remainder being treated by radium and x-rays alone, it has been our plan to employ operation in even the fairly advanced fundal carcinomata, applying radium ten days or two weeks later.

In discussing the contraindications to radium in the benign lesions, I shall limit my remarks to cases of myomata and so-called myopathic hemorrhage. Our belief that radium is not indicated in the treatment of many such cases is demonstrated by a recent review of our work which shows that about 50 per cent were subjected to operation. The selection of the one or the other form of treatment has been based upon what we consider important contraindications which can be stated as follows:

1. *Tumors larger than a three months' pregnancy.* Such tumors often present more or less extensive benign degenerative changes which are not favorably influenced by radium and are not uncommonly associated with adnexal or intestinal pathology, difficult or impossible to detect prior to operation and requiring surgery for its cure. Further, the vascular supply of these larger tumors is very limited and the effects of irradiation may so impair their nourishment as to bring about rapid degenerative changes.

2. *Rapidly growing tumors* suggesting sarcoma or actively progressing benign changes within the tumor, such as hemorrhage, necrosis or liquefaction.

3. *Uncomplicated tumors of any size giving rise to symptoms other than abnormal menstruation.* The symptoms requiring treatment are, to a great extent, mechanical in origin, the result of traction or pressure, hence their relief is dependent upon removal of the tumor. While disappearance of the tumor is a common occurrence following irradiation, the process is a slow one and excision is the better procedure. Again, such tumors are as a rule situated at some distance from the uterine cavity so that the full effect of the radium is not exerted upon them.

4. *Tumors associated with pelvic pain.* Pain in association with a myoma is not uncommonly due to adnexal disease, especially a chronic inflammation, to degenerations within the tumor or to an adenomyoma. Experience has taught us that radium may excite an acute exacerbation of an old inflammatory lesion and is to be avoided under such circumstances. A tumor which has undergone such extensive changes within its substance as to cause pain is not favorably affected by radium and should be removed by operation. We are of the opinion that adenomyomata do not react well to radium, although this statement is decidedly open to question. While it is often impossible to determine prior to operation the exact lesion responsible for the pain, we do know that whatever the pathology producing it may be, its treatment by operation is preferable to irradiation.

5. *Pedunculated tumors, whether subperitoneal or intrauterine.* Radium is useless in the treatment of pedunculated subperitoneal tumors; it often has no effect on the bleeding of pedunculated intrauterine tumors and its action may readily be followed by extensive necrosis of the tumor.

6. *Tumors producing hemorrhage and complicated by demonstrable adnexal pathology.* From what has been said in a preceding paragraph, further elaboration on this contraindication is unnecessary.

7. *The presence of a marked secondary anemia in association with tumors not giving rise to sufficient uterine bleeding to account for the anemia.* Three such cases have come under our observation. In each careful studies failed to demonstrate the cause of the anemia and at operation widespread necrosis of the tumors was found. Rapid disappearance of the anemia following operation warrants the conclusion that the necrosis was responsible for it.

8. *Tumors in young women.* Radium in sufficient dosage to cause disappearance of the tumor will very likely produce a premature menopause and sterility. Minimal doses are justifiable and often beneficial in the treatment of the so-called ovarian or myopathies

hemorrhages in young women but not, in our opinion, when a myoma is demonstrable unless some grave contraindication to operation is present.

9. *Tumors so distorting the uterine cavity that introduction of radium well above the internal os is impossible.* Under such circumstances, not only will the uterus be insufficiently irradiated, but subsequent contraction of the internal os incident to the fibrosis produced by the radium can readily occur, giving rise to hematometra or pyometra. Further, this condition precludes a thorough diagnostic curettage so that an area of malignancy may easily escape detection.

10. *In cases where differentiation between a myoma and an adnexal tumor cannot be definitely determined.* Even under the relaxation of ether anesthesia, this difficulty may arise and is an indication for operation rather than irradiation.

11. *Myomata or myopathic hemorrhage in nervous women.* A review of our cases shows that when full doses of radium have been used, and by this we mean 1200 milligram hours, menopausal symptoms develop in about 65 per cent. Of these, 35 per cent exhibit very marked symptoms. Even the normal menopause presents such wide variations in its symptomatology that an accurate comparison with the postradium menopause is impossible, nor can we prophesy what the effects of radium will be so far as the menopausal manifestations are concerned. It is our belief that the menopausal symptoms when they do develop after irradiation are more acute than the normal and that such exaggerated symptoms are more likely to follow in the highly nervous individual. Experience has taught us that operation is the wiser plan in the treatment of these patients, with conservation of one or both ovaries, a myomectomy if possible, or a supravaginal hysterectomy, attempting to leave sufficient endometrium so that a scanty menstruation may occur.

12. *In cases of radiophobia.* Because of the publicity given to radium and its effects by the lay press and the ill-advised or prejudiced statements made by members of the medical profession, a fear of its application may be so strongly embedded in the minds of some patients as to warrant its rejection in favor of operation.

This concludes the contraindications which govern us in our use of radium. If such restrictions are followed,—and in our Clinic only rare exceptions are made to them,—it is evident that a large proportion of benign lesions are at once relegated to the surgical domain. Contrary to the belief of some and the criticism of others, we hold that radium should not be looked upon as a competitor of surgery; each has its place in the treatment of benign uterine hemorrhage, the indications of each are sharply defined and the use of the one to the exclusion of the other is not to the best interest of the patient.

OUR PRESENT ATTITUDE TOWARDS FIBROID TUMORS

BY WILLIAM NEIL, JR., M.D., BALTIMORE, MD.

(Associate Surgeon, Howard Kelly Hospital.)

DAILY experiences reveal a remarkable lack of uniformity in the medical profession at large in its relation to the treatment of fibroid tumors of the uterus; whether or not to let a given case alone, or if active intervention is deemed wise, just what that intervention shall be. In a matter so important, where our totality of experience has been so large for the past forty years, I feel that we ought by this time to have reached a consensus of opinion, which still seems remote. After a considerable personal experience, having reached definite conclusions, I feel it worth while to state my own convictions and to invite criticism in the hope of helping to arrive at some measure of standardization.

I well recall my first uterine fibroid operation while I was the surgical resident at the Church Home and Infirmary in Baltimore in 1914. The patient, a married woman, aged forty-two, had borne three normal children and came on account of prolonged menstruation, more or less persistent for a year. I found a soft, globular fibroid, loosely filling the pelvic cavity, with no lateral inflammatory complications, for which I did a supravaginal hysterectomy; the patient recovered and is well today. My later experience has shown me this would have been an ideal case for radium therapy, where the operation, attendant risks and subsequent convalescence would have been avoided. During my residency I saw many similar cases, both of my own and with the visiting staff, many of which I criticize today from a newer and better viewpoint, so extensively has radium altered our therapeutics.

We have today manifestly before us the choice of one of the following plans of treatment: (1) operate and remove; (2) radiate; (3) "let alone and observe." 1.—I believe that operation is the wiser choice in the following types: (a) very large tumors, up to or above the umbilicus; (b) tumors associated with much pain; (c) tumors accompanied by pelvic inflammatory disease or any well-defined lateral complication; (d) multinodular tumors filling the lower abdomen; (e) all tumors complicated by malignancy of the cervix or uterine body; (f) tumors interfering with urinary function, especially those lodged in the pelvis and pressing on the bladder; (g) where there is a reasonable doubt as to the nature of the growth or some additional possible serious complication. 2.—Radiation is indicated: (a) in all tumors with hemorrhages, from small myomatous nodules up to freely

movable tumors reaching as high as the umbilicus, and occasionally much larger; (b) any of the operative class where operation is dangerous on account of some serious constitutional condition. 3.—The “let alone and observe plan,” as yet rarely recommended by doctors at large is, I believe, best in most cases, taking all fibroids as they come to the hands of the general practitioner. This judgment needs modification in an active surgical clinic to which patients are apt to be referred because of something unusual in their condition—in other words patients who have been carefully studied by their home doctor over a considerable period. Where there is no obvious disturbance to health present or threatened, it is safer to advise the “let alone” plan; the mere fact of the discovery of a tumor is not a sufficient indication for operation, as many believe. This fear of a tumor or “onkophobia” was generated a couple of decades ago by articles piling up statistics and setting forth the numerous complications frequently found with fibroids and their degenerations. While we do not question the statistics, we do consider the deductions and consequent practice based upon them largely erroneous.

I would insist, in correction of this error, that these possible complicating conditions, which have so often been used to induce the patient to submit to operation, can almost invariably be discovered with a careful examination. This then enables the surgeon to operate not for fear of meeting some one or more out of the long list of complications, but because of the known presence of a particular and clearly determined complication, while at the same time he has refused to operate in other cases in which he has found no complication. For example, ovarian cysts and dermoid tumors can be felt, cancer of the mucosa or cervix and sarcoma can be found by curettage. Again, the complaint of an undue amount of persistent pain justly excites suspicion and determines operation. Many of the complications are really too trivial to mention.

My conclusion, therefore, is that it is possible to found the operation on a definite diagnosis as to the growth itself or its determined complications and not upon a mere statistical phobia.

Taking as a sample a group of 62 cases gathered from a rapid survey of a large number of histories, these divide themselves from the viewpoint under discussion into two groups: (a) those referred by doctors with a view to operation, 28 in number; (b) those discovered for the first time by us while examining for some other complaint, 34 in number. In each case the fibroid gave rise to no symptoms, and in none was an operation advised. The patients were sent home with instructions to be examined about every six to twelve months; if there was any tendency on the part of the tumor to give rise to troublesome symptoms at a later date, operation or radiation

would then be recommended. Of the group of 62 the average age was forty-one years; 40 were married and 22 single. The tumors varied in size from a small nodule or nodules within the uterine body, a multinodular or small globular tumor which loosely filled the pelvis, to those easily felt above the symphysis or reaching half-way to the umbilicus. The upper limit is arbitrary and may be extended or diminished; extended in the case of the larger, movable growths where the patient is comfortable, diminished as in retroflexed uteri with the tumor filling the pelvis and approaching the point of exerting pressure. If a patient lives where she cannot be followed up and examined, it is then often a better plan to adopt one or other method of treatment. We would also modify this dictum and operate or radiate when she has an incurable "onkophobia" and spends her days brooding over the tumor and its possible consequences.

In a considerable number, where we find a globular uterus and evidence of a single tumor in a young married woman desirous of children, we urge myomectomy with the permission to act more radically in case of necessity or error in exactness of diagnosis. A number of pregnancies have occurred in this group.

I would summarize this brief communication as follows:

1. There is too much operating done on fibroid tumors on insufficient indications.
2. The average fibroid does not need operation, but occasional observation; this applies to those up to about the size of a five months' pregnancy.
3. The possible "complications" have too often been used as a bugbear to stampede patients into operation on the ground of what might take place if the tumor is let alone, or again on the supposition of presumptive complications to be discovered at operation.
4. This whole standpoint is not rational, as the serious complications can be discovered by careful physical examination.
5. Cases where there is any grave doubt as to diagnosis or complications should be included in the operative class.
6. Many cases where "fibroids with complications" have been found and an operation done have been incorrectly billeted. The proper label would be a small fibroid incidental to the other trouble.
7. Fibroids with serious complications, demonstrated or suspected, call for radical operative treatment. Where the fibroid is uncomplicated, if treatment is called for, then radium must be given the first consideration and operation the second.

PURPURA HEMORRHAGICA (POSTPARTUM) TREATED WITH RADIUM AND ROENTGEN RAY WITH REPORT OF A CASE*

BY CARL GOLDMARK, M.D.

(Attending Physician, Lebanon Hospital)

AND A. W. JACOBS, M.D.

(Radiotherapist, Lebanon Hospital; Adjunct Physician, Montefiore Hospital, New York, N. Y.)

PURPURA hemorrhagica is not a very common condition. At the Massachusetts General Hospital 65 cases of idiopathic purpura occurred among 155,884 medical and surgical patients during 33 years; at John Hopkins, 41 cases in 18,594 medical patients; at the Hamburg General Hospital, 73 cases in 41 years in a total of 100,000 patients.

The senior writer in the course of his clinical work had opportunity to see various types of purpura hemorrhagica and in his experience, cases that follow pregnancy are the most severe type.

The use of atropine was regularly followed by marked signs of improvement, and in the case reported here, it acted in the usual way in the primary attack, but failed in the relapse.

The present case is reported because purpura hemorrhagica following pregnancy generally ends fatally, while this case recovered and furthermore because radiotherapy in some manner evidently contributed to the favorable outcome.

Mrs. S. W., age twenty-eight, housewife, born in Russia, was admitted to the Lebanon Hospital March 31, 1922, with the following history: About eight weeks prior to admission was delivered of a full term baby, normally. During her postpartum period had the usual moderate bloody discharge from the vagina for the first week, which then increased until her discharge from the sanitarium three days later and continued on the increase after she arrived home. During the latter part of her pregnancy had occasional bleeding from the nose and gums, slight in amount. About ten days postpartum bleeding from her gums reappeared. Five weeks later her condition became so alarming that a transfusion was done.

There was no family history of hemophilia or hemorrhagic diathesis. Past history, personal and menstrual, was negative.

On admission to the hospital was suffering from profuse vaginal bleeding, bleeding from the gums and general weakness and debility and was admitted to the gynecologic service of Dr. Rongy.

Physical examination showed marked pallor, scabs about the lips indicating recent bleeding, petechial hemorrhages on roof of mouth, bleeding from gums, and vaginal bleeding. The skin all over her body was covered with petechia which were most marked where pressure was evident.

*Read at a meeting of the Bronx County Medical Society, October 17, 1923.

On admission the temperature was 101.6° F. pulse 110, respiration 28. Red blood cells, 2,890,000, hemoglobin 60 per cent, white cells 8,200, polys 75, lymphocytes 26, blood platelets 122,620. Coagulation time 11 minutes (which according to the method used was within normal limits). Bleeding time nine minutes. Vaginal examination, except for the bleeding, was negative.

Transfusion was given with no effect on the hemorrhages. After the transfusion blood examination showed red cells 3,500,000, hemoglobin 65 per cent, white cells 8600, blood platelets 160,000, coagulation time nine and one-half minutes, bleeding time six minutes. Urine was bloody, albumen 3-plus. Stool was negative. Blood pressure 95/45. Blood chemistry normal. Wassermann negative and ophthalmologic examination negative.

The patient was transferred to the Medical Service, still bleeding, complaining of blurred vision, generalized pains most marked over both tibiae with tenderness due to subperiosteal hemorrhages, and pains in right side of chest close to sternum. These latter were caused by a hemorrhagic pleurisy evidenced by leathery friction rubs over this area, which disappeared and reappeared with every appearance and subsidence of pain. After a period of nine weeks in the hospital, under atropine therapy, hemorrhages finally subsided, patient's condition improved, and she was taken home. On discharge, blood examination showed 3,200,000 red cells, hemoglobin 70 per cent, white cells 7000, platelets 175,000. One week later commenced to bleed anew from the vagina and was re-admitted to the hospital May 27, with a temperature of 100.8° F., pulse 112, respiration 28. Blood examination showed 4,000,000 red cells, hemoglobin 79 per cent, 10,200 white cells. Bleeding time nine minutes. Coagulation time 11 minutes. Blood platelets 160,000. On June 4 transfusion was done with no effect on the hemorrhage but a fairly marked serum reaction. Examination of the blood on June 5 showed 3,200,000 red cells, 42 per cent of hemoglobin and 7800 white cells. Platelets 155,000. Blood pressure 95/75. All symptoms of the primary attack were reasserting themselves, including the hemorrhagic pleurisy, this time associated with choking sensations and accompanied by cough and bloody expectoration.

The condition of the patient grew worse, anemia becoming more profound and despite the various therapeutic measures used, including atropin, calcium, coagulen, thromboplastin, placental extract, horse-serum, transfusions and packing the vagina, the hemorrhages persisted. It was therefore decided to apply radiotherapy, with two purposes in view: (1) to produce an artificial menopause, and (2) to attempt to influence the abnormal structure of the blood.

On June 8, the patient received her first radium treatment. Her condition was so critical and her anemia (Hgb. 35 per cent) of such marked degree that another transfusion of 500 c.c. was given without any influence on the metrorrhagia or the bleeding in general.

During the following four weeks, bleeding was more or less continuous, though not profuse, mostly from the vagina, but also at times from the gums and nose. Petechial spots appeared in the skin over the eye-lids, chest, and of the extremities. On June 27 blood examination showed hemoglobin of 18 per cent, no platelets observed at all, and no retraction of clot.

Though the hemorrhages seemed to show gradually a diminution in amount, it was not until July 24 (about six weeks after use of radium was started) that we noticed cessation of hemorrhages and a marked improvement in the general condition of the patient.

It is important to state here that as a general rule, the full effect of a course of radium therapy in any condition does not manifest itself until six to eight weeks have elapsed.

Examination of the blood on Aug. 12 showed 5,000,000 red cells, 85 hemoglobin.

Coagulation time five minutes. Bleeding time one and one-half minutes. On Oct. 4 patient was discharged from the hospital in excellent condition, no hemorrhages present.

No bleeding occurred until May 3, 1923, when moderate vaginal bleeding commenced, lasting ten days, for which another course of deep roentgen therapy to the pelvic region was given. Blood examination showed red cells 3,700,000, hemoglobin 86 per cent, white cells 7400, platelets 220,000. Bleeding time three minutes. Coagulation time 10 minutes.

During the first six weeks of radium therapy patient received about 20,000 mc. hours applied over symphysis, vulva, spleen, and per rectum in divided doses.

After the patient left the hospital, radium therapy was continued over the spleen but in smaller dosage, giving about 100 mc. hours twice a month and deep roentgen therapy to the pelvic region at intervals.

Examination of the patient's blood on April 16, 1924, showed the following: red blood cells, 4,224,000; hemoglobin, 75 per cent; white blood cells 5800; P., 60 per cent; S. L., 26 per cent; L. L., 7 per cent; E., 4 per cent; Mon., 3 per cent. Bleeding time, 6 minutes; coagulation time, 8 minutes; platelets, 96,000 per c.c. min.

The literature presents few cases of the postpartum type, and all proved fatal within a few months.

John Diehl,¹ reported a case in a woman, aged thirty-eight, para vi, no miscarriages, who aborted in the fifth month, with extensive hemorrhages throughout which proved fatal soon thereafter.

Ottenberg and Libman,² in a study on blood transfusion reported two cases of postpartum type of purpura hemorrhagica which were fatal.

Among the observations of the effects of radiotherapy on the blood, Kazenelson and Lorant³ have shown that the bleeding time is shortened after irradiation.

In reference to splenectomy in general blood conditions, Levin⁴ maintains that in any type of disease where the spleen is considered a possible cause of exerting a destructive influence, radiotherapy should be tried in lieu of a splenectomy.

CONCLUSION

In this case the most threatening phenomenon was the metrorrhagia, and it is well known that the essential or climacteric type is promptly influenced by radiation. Regardless of etiology, it was worth while to try its action on this metrorrhagia and general purpura, and it is very significant that even when the metrorrhagia was caused by a general condition, such as was apparent in this case, the result was satisfactory. It seems evident that the radium therapy was followed by a clinical arrest of the disease which is lasting now 18 months, while no other method of therapy was able to produce this effect.

REFERENCES

- (1) Diehl, J.: Stuttgart, Union Deut. Verlagsgesell., 1899. (2) Ottenberg and Libman: Am. Jour. Med. Sc., July, 1915. (3) Kazenelson and Lorant: Münchn. Med. Wchnschr., Feb. 4, 1921, p. 132. (4) Levin, I.: Jour. Am. Med. Assn., Sept. 17, 1921.

A MIXED CELL TUMOR OF THE UTERUS*

BY SOLOMON WIENER, M.D., NEW YORK

MIXED cell tumors of the uterus are by far the rarest form of neoplasm encountered in this organ. Of the very limited number of such cases, the majority reported have been such as spring from the cervix. Much less frequently they arise in the body of the uterus. Most of these tumors of the corpus uteri are mesodermal mixed cell tumors. The case I wish to report is one of fibrochondromyxosarcoma, of teratoid type, arising in the endometrium of the fundus uteri. Up to 1908 there were only eleven of these cases of teratoid type reported in the literature. These are collected in the second edition of Veit's *Handbuch der Gynaekologie*, where there is a fairly full exposition of the subject.

Since that date I have been able to find six further reports of such teratoid tumors, of which only two have been in the American literature.

Jessup reported the first American case in 1913. According to him, the growth consisted of (1) areas of large spindle cells, the general picture of an actively growing spindle-celled sarcoma; (2) large irregular alveoli lined by cuboidal epithelium and surrounded by connective tissue stroma; (3) masses or nests of round or oval cells with the appearance of carcinoma; (4) scattered islands of hyaline cartilage.

The second American case, reported by Perlstein in 1919, is very similar to mine. He called the tumor a botrioid chondrosarcoma of the endometrium of the corpus uteri. There were two kinds of tissue predominating, cartilage, and a loose connective tissue. In the latter the nuclei are far apart and the tissue is myxomatous in appearance. There are also sarcomatous areas, and isolated glands of the endometrial type.

In Nicholson's case at Guy's Hospital, London, the tumor was composed of connective tissue, cartilage, epithelium, and sarcoma.

Murray and Littler report a case in which the tumor was made up of connective tissue, sarcoma-like structures, gland tubules, and small nodules of cartilage. They state that the general appearance of the growth "is essentially the same as the common embryoma of the ovary or testis."

Chavannaz and Nadal report two cases. The first is an adenomyo-chondrosarcoma. The second they term an epithelial chondromyo-

*Read at a meeting of the New York Obstetrical Society, February 12, 1924.

sarcoma. This growth was composed of cylindrical epithelium, epidermal type of epithelium, sarcomatous tissue, and nodules of cartilage.

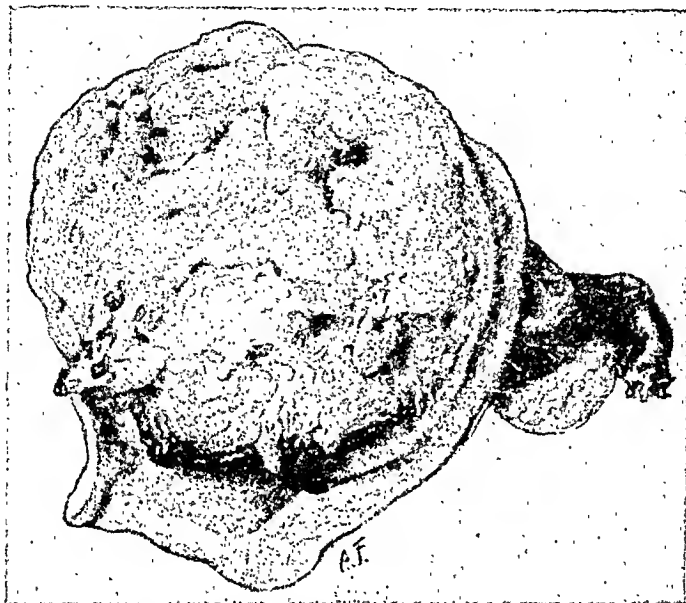


Fig. 1.—Uterus laid open, showing extent of tumor. Note hypertrophy of myometrium.



Fig. 2.—Photomicrograph, low power. Above, a glandular acinus lined with high cylindrical epithelium. Note that this is not endometrial in type. Below, an area of cartilage extending across the field.

These seventeen cases show the following common characteristics. The tumors spring from the corporeal endometrium. They are made

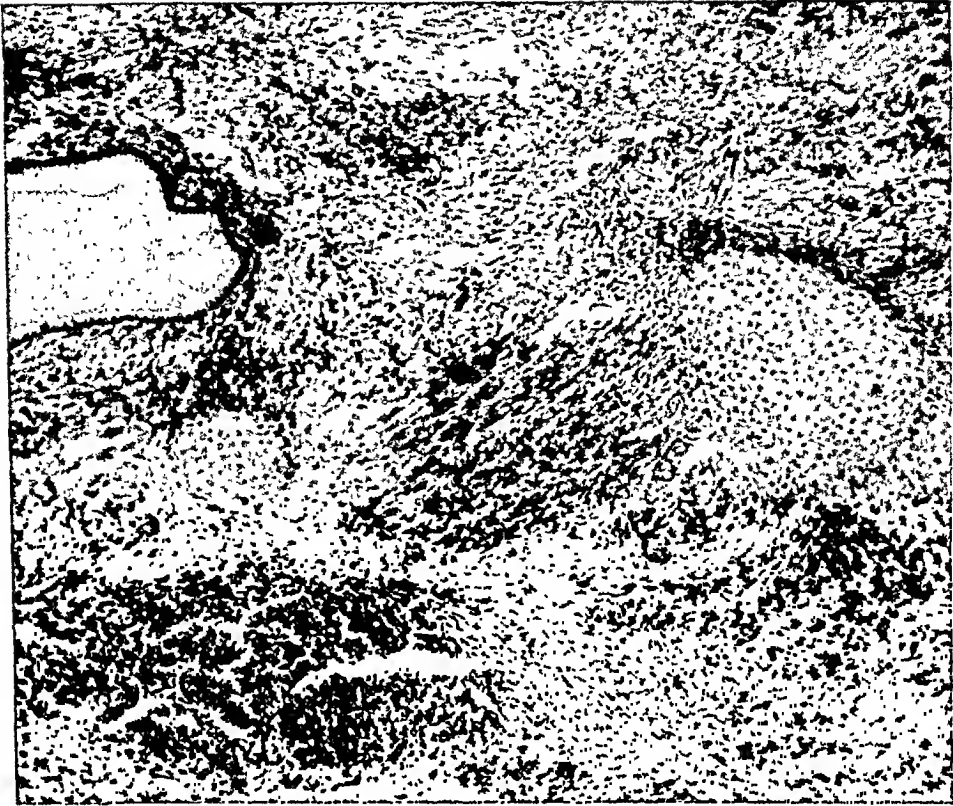


Fig. 3.—Photomicrograph, low power. Irregular connective tissue stroma. A glandular acinus to the left; a nest of cartilage cells to the right; a sarcomatous area adjacent to the cartilage.

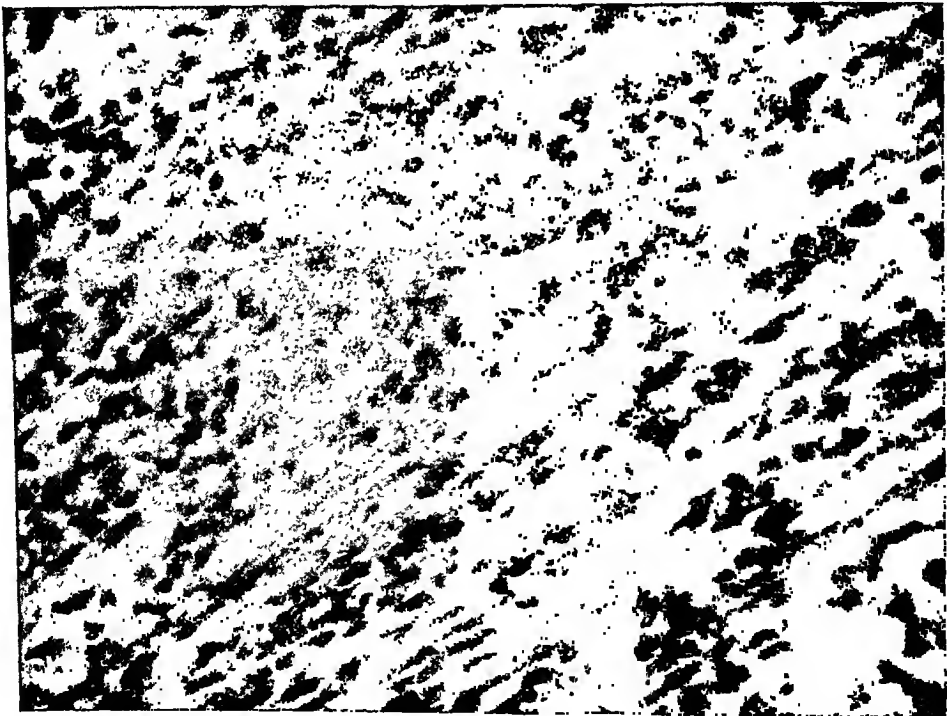


Fig. 4.—Photomicrograph, high power. The area of large round cell sarcoma shown in Fig. 3.

up of connective tissue, various types of sarcoma, islands of cartilage, and epithelium of different types. The epithelium is usually found lining glandular alveoli, and often differs markedly from the endometrial type. Myxoma-like tissue is also a frequent finding. Such growths have all the characteristics of teratoma and merit being classified as a clinical and pathologic entity—teratoma of the uterus.

To attempt to discuss the histogenesis of this type of tumor is to wander far afield into the realms of speculation. The most plausible theory we have ascribes them to the development of cells which are a fetal inclusion in the body of their host.

Clinically these tumors largely assume the characteristics of sarcoma, especially in their rapid growth and the large size to which they attain. As a rule they come to the attention of the clinician as polypoid masses protruding from the cervix. The broad pedicle and central portions of these are firm and fibrous. The peripheral portions are apt to be soft, edematous, and even necrotic. They grow rapidly and have the irregular profuse bleeding common to other malignant tumors.

Pain, severe and cramp-like in character, is an earlier symptom than in carcinoma, and is due to attempts at extrusion of the large intra-uterine mass. Metastases may be local, or in far distant regions of the body, as in other forms of highly malignant tumor. The history of the case I wish to report follows.

Mrs. J. H. R., fifty years of age, was first seen in consultation with Dr. H. M. Koles on October 24th, 1923. There were no points of special interest in her family or past history. She had two children, the last fourteen years ago. There had been two abortions in the second month, the last sixteen years ago.

The menstrual history was normal until the menopause which occurred a year before she was first seen by me. There had been no vaginal bleeding whatsoever from October, 1922, until June, 1923. At that time there was slight spotting of dark blood for one day. About the middle of September spotting began again. This gradually increased until the bleeding became profuse, and was associated with severe cramp-like pains. When I first saw her she had been bleeding more or less continuously for five weeks.

Examination showed a small, frail, poorly nourished, markedly anemic woman. The general physical examination was otherwise negative. There was moderate bleeding. There was a firm polypoid mass, protruding from the os uteri about five centimeters into the vagina. The uterus was hard, slightly enlarged, but regular in contour; the adnexa were negative.

The next day the cervix was dilated under ether anesthesia. With this there was an escape of considerable masses of soft necrotic tissue from the uterine cavity. The polypoid mass was twisted off. It was noted that it sprang from a broad fibrous pedicle whose point of implantation high up in the uterus could not be exactly determined. A finger was passed into the uterus and it was found to be empty. The endometrium felt smooth and regular except at the fundus where there were two small, slightly elevated ridges. Curettage brought away practically no tissue.

The polypoid mass removed was eight centimeters long, and about three centimeters in diameter. Its central portion was firm and fibrous, while portions of its

periphery were soft and necrotic. Scattered through its substance were small isolated very hard areas, varying in size from that of a pea to pin head. These proved to be areas of pure cartilage.

The polyp was submitted to Dr. F. S. Mandlebaum, pathologist to Mount Sinai Hospital, who pronounced it to be "a fibromyxochondrosarcoma, containing islands of glandular tissue; in other words, a tumor of teratoid nature."

Study of sections of the tumor showed an irregular connective tissue stroma. There were large areas of cartilage. Some of these were surrounded by myxomatous tissue; others by undifferentiated connective tissue, rich in blood vessels. Some fields contained masses of large round cells, with many small blood vessels, and all the characteristics of sarcoma.

There were also present glandular acini, some of which were completely filled with epithelial cells. There were a few transverse sections of spaces lined by high cylindrical epithelium. This differs very much from the endometrial type of epithelium.

After the removal of the polyp all bleeding ceased, and the cervix closed. In view of the anemic and generally wretched condition of the patient, it was decided to wait and build up her strength before proceeding further. Meanwhile she was kept under close observation.

In spite of urging it was not possible to obtain the patient's consent to further operation until December 12 when there was renewed bleeding and pain. At that time it was found that the uterus had enlarged to the size of a three months' gravidity. It felt hard and somewhat irregular in contour, but was freely moveable. The cervix was closed.

The patient was admitted to Mount Sinai Hospital where a laparotomy was performed. On opening the peritoneum the uterus was found uniformly enlarged, hard and smooth. Both adnexa were normal. The peritoneum was everywhere smooth and shiny. There were no adhesions, no masses in the liver, mesentery, or intestine, and no infiltration of the parametria. A typical panhysterectomy and bilateral salpingoophorectomy were performed. The patient made a good operative recovery, and to date (May, 1924) has gained in flesh and strength.

Specimen:—uterus with normal adnexa. The uterus the size of a three months' pregnant organ, its peritoneal coat smooth and shiny. Upon incising the uterus in the midline on its anterior surface the picture represented in Fig. 1 presented itself—a tumor mass filling the uterine cavity, extending from the fundus almost to the level of the internal os. In the fresh state the tumor was of a yellowish color and had a somewhat translucent appearance. To the touch it was firm and fibrous. The myometrium was hypertrophied, and there was about half a centimeter of uninvolved muscle tissue between the tumor and the peritoneum.

Microscopic examination of the tumor showed it to be identical in structure with the polypoid mass previously described. Undoubtedly this had sprung from the tumor itself in the uterine wall. Sections from the ovaries showed them to be normal.

REFERENCES

- Chavannaz and Nadal*: La Gynecologie, Paris, 1920, xix, 3. *Jessup, D. S.*: Proc. New York Path. Soc., 1913-1914, xiii, 81. *Perlstein, I.*: Surg. Gyn., and Obst., 1919, xxviii, 43. *Murray and Littler*: Jour. Obst. and Gyn. Brit. Emp., 1914, xxv, 26. *Nicholson, G. W.*: Guy's Hospital Reports, London, 1918, lxi, 173. *Veit*: Handbuch der Gynaekologie, 2nd ed., 1908, vol. 3.

67 WEST EIGHTY-NINTH STREET.

(For discussion see page 219.)

REPORT OF TWO CASES OF DIAPHRAGMATIC HERNIA

BY J. D. CLARK, M.D., WICHITA, KANSAS

SINCE the World War there has been a deluge of case reports of diaphragmatic hernia. These have been almost entirely of traumatic origin and are of interest primarily to the surgeon. Having seen two congenital cases of defect of the diaphragm in the course

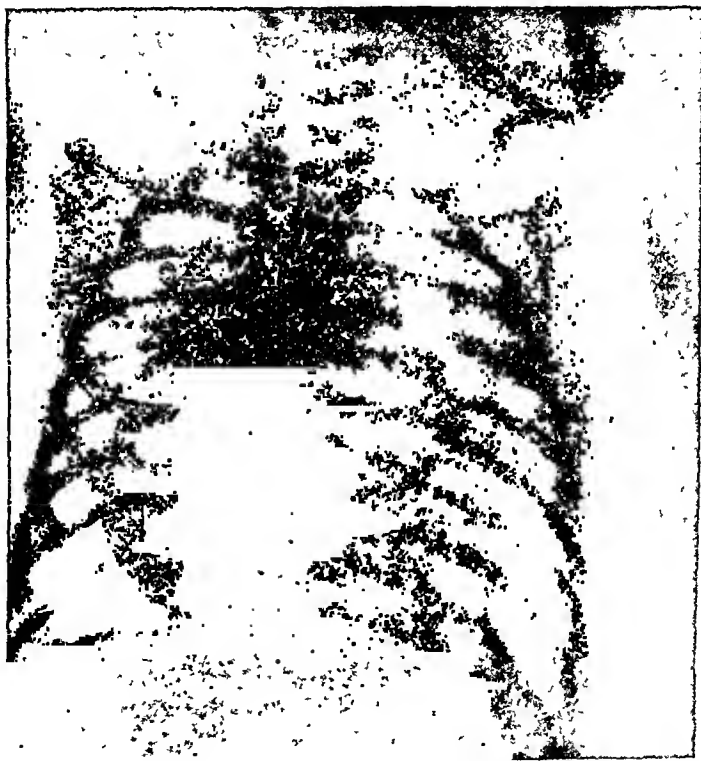


Fig. 1.—Showing heart to right of sternum and numerous small coils of intestine in left chest.

of private practice in the past four years, I cannot but wonder whether this is not more common than we have considered it in the past. The first case, I frankly overlooked and found postmortem.

The mother was a healthy primipara, twenty-four years old, who passed through a normal pregnancy and labor. The baby, a well developed and apparently healthy boy, weighed eight pounds. He had recurring attacks of dyspnea with cyanosis that lasted from a few minutes to several hours. The heart was on left side of sternum during free intervals. He died suddenly when two weeks old in an attack of dyspnea. He nursed well when not prevented by the shortness of breath. Autopsy showed a defect in the left side of diaphragm,—the opening the size of a fifty cent piece had distinct thickening of its edges. There was no peritoneal sac. The left lung was collapsed, but had air in it and could

be inflated. The stomach and all small intestines and ascending and transverse colon were in left chest.

The second case was the third child of a healthy mother, the other children being normal in every way. This was a boy baby weighing seven lbs. nine oz. He was born cyanotic and had not cleared up two days later. His cry was never lusty but of moaning character. He nursed with great difficulty and part



Fig. 2.—After barium in mother's milk already going through bowel in chest. Note size of stomach in a 7 lb., 9 oz. baby.

of time could not nurse at all owing to dyspnea. There was a large amount of flatulency that could not be entirely relieved by enemas.

On physical examination, the heart was to the right of the sternum, right chest resonant on percussion, and breath sounds were always normal over right side. The left chest was tympanitic and at times gave sounds of percussing over a cavity. There was always absence of breath sounds over whole left chest. At one or two examinations, gurgling could be heard on left side.

Diagnosis of diaphragmatic hernia was made and verified by x-ray (Fig. 1).

The following day by adding barium to the mother's milk, the other plates were obtained. The baby died on the sixth day.

Postmortem Examination.—The jejunum ileum ascending (except caput coli) and transverse colon were in the left chest. There was no peritoneal sac. The defect extended from the columnar attachment to the vertebra in a curved line across to the midaxillary line, ending in a sharp point. There was no thickening



Fig. 3.—Shows advancement of barium and partially emptied stomach.

of the edge of the defect in diaphragm nor any line around posterior chest wall to show where chest cavity and peritoneal cavity joined. There was a small tag of tissue in the apex of left chest—all that remained of the left lung.

This case differed from the other in never having complete relief of dyspnea, size and shape of defect, and the difficulty with which it could be closed. Owing to the size and shape of the defect, I was struck by the ease with which the left kidney could be rotated upward and anchored to the edge of the opening, thus completely closing the latter.

ORPHEUM THEATRE BUILDING.

Society Transactions

NEW YORK OBSTETRICAL SOCIETY

MEETING OF FEBRUARY 12, 1924

THE PRESIDENT, DR. F. A. DORMAN, IN THE CHAIR

DR. S. WIENER reported a case of **Mixed-Cell Tumor of the Uterus**. (For original article see page 211.)

DISCUSSION

DR. HAROLD BAILEY.—I would like to ask whether it is necessary to use x-ray or radium as a further treatment in this particular case.

DR. ASA B. DAVIS.—The speaker has just reported that he found this condition in the uterus and that some weeks later a panhysterectomy was done. I did not suppose that it was considered good surgical treatment to wait so long.

DR. S. WIENER (closing).—I believe that radiation is just as much indicated in this particular type of malignant tumor as in any other.

With respect to Dr. Davis' question about the length of time which elapsed, the patient was in a very wretched condition from the bleeding and I intended to wait but a very short time before going ahead, but it was almost a week before we knew the exact nature of this growth. The pathologist at first was very much in doubt because he personally had never seen such a condition, and after I was ready to go ahead, neither the patient nor her husband was willing, despite urging, and it was only when she began to bleed again, as I told her she surely would, and to have pain, that they consented to further operation.

DR. FLOYD E. KEENE, of Philadelphia, (by invitation) presented a paper entitled **Contraindications to Radium in the Treatment of Diseases of the Female Pelvis**. (For original article see page 201.)

DISCUSSION

DR. HAROLD BAILEY.—I have been especially interested in his conclusions from the standpoint of the benign tumor—the fibromyoma—and agree with him in almost every particular. In the presence of a large tumor, or a pedunculated tumor, either outside of, or within, the uterus, or in the presence of pain which indicates other pathology, surgery is indicated, and I feel from my short experience that the most disconcerting and troublesome results come from attempting to treat these fibromyoma with radium.

I believe that a young woman with menorrhagia of indefinite origin should be treated with radium with a very careful consideration of all the facts. To absolutely sterilize a woman with a dose of radium seems unnecessary, nevertheless it is probable that a dose of radium that merely limits the menorrhagia and that

allows her to go on ovulating may be dangerous from the point of view of future impregnation.

I disagree with Dr. Keene in regard to early carcinoma of the cervix. I believe that this is a condition in which radium treatment is certainly applicable here because a dose may be conveyed out to the parametrium that will prohibit the growth of cells within a certain radius of the cervix. These remarks presuppose that massive amounts of radium are available to the operator.

I agree with the doctor's statements that carcinoma of the body of the uterus should be removed by hysterectomy. Contrary to his views, I feel that radium should first be implanted in the body of the uterus to render inert the cells that are present. However, I do not take the position I took several years ago that there should be a long interval between the irradiation and the operation. I believe that if a dose of radium is implanted in the body of the uterus in cancer of the body, the uterus should be removed in seven or eight days.

DR. JOHN O. POLAK.—The value of radium in fibroids and other uterine hemorrhages is dependent on the diagnosis and its employment should not be entrusted to the hands of the roentgenologist or the radiologist. The more I see of these cases the more convinced I am that what Dr. Keene has said is true, particularly in these fibroid cases that are associated with unexpected anemias. These are the cases in which in the past we have used radium and subsequently had to operate upon and we found that degeneration, and that the anemia cleared up when the tumor was removed, and that it was the result of an absorption from the tumor.

With the use of radium in the hemorrhages of young girls, we have had considerable experience. We have followed a number of these girls through pregnancy and child birth and while Dr. Bailey feels that radium may have some lethal effect upon the unborn fetus, I am convinced from my clinical experience with cases that have subsequently become pregnant and have been delivered, that the judicious use of radium for these so-called myopathic hemorrhages in some of the young women has not the effect that Dr. Bailey claims on the unborn child. The use of radium in small dosage in these patients does not interfere with their subsequent menstrual life to any very great extent. The younger the patient the more chance she has of re-establishing her menstruation, even when we use a dosage that is rather larger than that suggested for the correction of some of these hemorrhages because of the fact that the deeper and younger follicles that subsequently come up toward the ovarian surface are not destroyed by short irradiation.

There often is the difficulty, even under anesthesia, of making a diagnosis of parametrial or adnexal lesions in the presence of fibromata, particularly if these lesions are the result of postpartum or postabortal infections. Radium seems to have a most stimulating effect in activating these lesions and causing very great subsequent trouble.

DR. W. P. HEALY.—There are certain points that may possibly be emphasized. As Dr. Keene has said, we more or less definitely agree that the submucous fibroid is one that preferably ought not to be treated by radium within the uterus, and yet occasionally that sort of treatment, may be tried. For instance, about three years ago I saw in consultation a woman who had an exceedingly bad cardiac lesion so that a competent internist here in New York City was of the opinion that under ordinary conditions she probably would not live more than five years. At this time she was having rather severe and annoying uterine bleeding which had only recently set in. She was about forty and weighed about 265 pounds, and was running a temperature which seemed to be due to the uterine condition. It was manifestly unwise to attempt a hysterectomy, the uterus was about the size of a 2½ months' pregnancy. I introduced two tandem capsules with a millimeter of

platinum filtration containing 100 milligrams of radium, into the uterine canal and irradiated the uterus. She had several submucous fibroids bulging into the uterine cavity which were apparently the source of the bleeding. The result was perfect, the local lesion cleared up. I saw that patient a few days ago, and she has had no bleeding from the uterus now for three years, and yet in the face of a temperature and submucous fibroids we irradiated the uterus.

Another great difficulty is that these tumors do not respond to irradiation very quickly. I use a somewhat larger limit for size than Dr. Keene mentioned. That is, I will irradiate them up to the size of at least a 4 months' gestation. Those patients do not show a quick response. Despite the fact that we warn them that the next menstrual period may be more profuse than the one they had before and that they need not be alarmed. Very often they do become quite alarmed and some near-by physician who is called in examines them and says: "Of course, radium has not done you any good, your tumor is still here." The result is the patient is at once discouraged and is taken to some near-by hospital and a hysterectomy is done, despite the fact that the surgeon in that hospital is informed that the patient has within a month been treated with radium. Yet when you do hold them off, it very seldom will happen that the patient will need a hysterectomy. I think it is a little unfair for us to ask a patient to take a risk of mortality if we can encourage her to wait a while.

Then there is the question of using radium to control the bleeding in the young woman. There is always an element of risk that is sometimes going to be very embarrassing for the man who uses radium, especially if he allows himself to become a little bit enthused in his dosage. I would far rather have the patient return to me six months later and say that she is still bleeding too much than to have her keep coming back to me six months or nine months or a year later and ask when she is going to have her menstrual period, and neither you nor I can tell from the gross appearance of the curettings just the type of tissue we are dealing with. A small dose of radium, not more than 500 milligram hours will stop the menstrual period almost permanently in young women if there is a good deal of lymphoid structure in the interglandular tissue. In other words, if the supporting network, the supporting tissue of the endometrium is largely lymphoid in structure, you may have a complete destruction of that and no regeneration. So I feel very keenly that the first treatment of the young woman should be merely a curetting and then get the pathologist's report, and if the bleeding returns and the endometrium is normal, with no excess of lymphoid tissue, you may, if you see fit to do so, use radium later; but the first application of radium in these cases is always a great gamble, and while we have done it safely, I am becoming more and more apprehensive about it the further and longer I deal with it.

DR. H. N. VINEBERG.—One of my cases was a woman who came to my office in a most nervous, excitable condition; in fact, the entire family, husband and daughters came with her. The patient had been radiated at the Memorial Hospital and said she was told she had cancer. She had a fibroid uterus the size of about a six or eight weeks' pregnancy, with no signs of malignancy. She was forty-four years old. I removed the uterus and she has been perfectly well and no longer has any fear of cancer. That was one of the strong points in Dr. Keene's paper, that in a great many of these women the moment you mention radium to them they develop a cancer phobia.

The other case was somewhat similar to the one already mentioned. In this case the patient was just simply frightened out of her wits. In her case the radium also had not been effective, her hemorrhage had continued, and on opening the uterus (it was not a very large uterus), there was a good-sized submucous fibroid which evidently had not been influenced by the radium.

DR. F. R. OASTLER.—May I ask Dr. Keene what experience he has had with the high voltage x-ray in the after-treatment of cases operated on for carcinoma of the cervix? In other words, whether it is the opinion of his clinic that it is better to use high voltage radium or low voltage radiation. I ask this question because during the past three and a half years that we have been using the high voltage current I have come to the conclusion that in almost every case, aside from possible benefit to the malignant disease, we are doing a very serious injury to the patient in its treatment.

DR. S. H. GEIST.—A question that has aroused a great deal of interest is the so-called myopathic hemorrhage, which is not a myopathic hemorrhage, because, as far as we can appreciate, there is no lesion or disease in the musculature of the uterus. The same precautions there as in the fibroids must be taken; that is, an attempt made to classify the type of so-called myopathic or essential hemorrhage. Recently Halban has described a group of these cases in which pelvic irradiation was carried out without effect, the hemorrhage not being influenced, and he found in examining the blood, a condition of extremely lowered platelet count. In several cases they radiated the spleen, and in one instance in which splenectomy was done the patient was absolutely cured without any ill effect on the pelvic apparatus. That is very important. If we can classify the types of so-called essential hemorrhage into those groups due to a lesion in the ovary and those due to a lesion in the blood vascular system or an endocrine dyscrasia, such as the thrombocytopenic or the purpuric type, it will mean another step forward in the limitation of the cases that should be operated on and those that should not be operated on, and then, in the former class, we will be able to avoid waste of time and possible damage to the uterine organs by the use of radium or x-ray.

DR. KEENE (Closing).—Regarding irradiation in young women, I cannot agree with Dr. Bailey in his point at all. Our experience has been the same as that of Dr. Polak. In other words, we lay great stress upon the fact of not using radium in treating myomata in young women, as I brought out in the paper; so commonly do we come in contact with what is called myopathic, ovarian and essential hemorrhage, the cause of which we do not know in young women in whom we hesitate to do a hysterectomy, in whom curettage is only of temporary benefit at the best, that our hands are tied and something must be done to control the bleeding. Under these circumstances we feel we are justified in using radium, but in using it in extremely small quantities. The younger the patient the less the dose of radium. It is better to underirradiate than overirradiate. For example, in women under thirty years we wouldn't think of giving more than 200 milligram hours, trying it out and explaining to the patient that perhaps there may be a recurrence. It is better to give a little dose, perhaps a little larger the second time, or even to subject the patient to hysterectomy rather than use a large dose of radium.

So far as pregnancies are concerned, we have had 5 patients who became pregnant following irradiation. Our experience has been that there has been no harm done in that respect.

In the treatment of fundal carcinoma, I think Dr. Bailey's suggestion of using a preliminary irradiation is a very wise precaution.

I think Dr. Healy brought out a point that we should impress upon our patients before leaving the hospital. In other words, we make it a rule after irradiation to explain to the patient what she may expect. We tell her that the first period succeeding the irradiation may be more profuse than normal, just as profuse as it was before, or that it may be scanty, or not come on at all. We cannot prophesy what will happen after the first irradiation, but the second period after irradiation will not appear, or will be very scanty, if a full dose is used. In about 75 per cent of cases a discharge will develop. We tell the patients just what is likely to happen

and in this way they are not so anxious as they would be if the situation were not fully explained to them.

Dr. Vineberg brought up a point which I think is extremely important, especially as regards nervous women. We have not seen this contraindication given, but we feel it is a very important one. In very highly nervous women I am confident that they stand operation better than irradiation.

So far as Dr. Dickinson's question regarding the 50-50 chance of the patient receiving either radium or surgery is concerned, I would state that I was speaking of so-called myopathic hemorrhage and myomata, not just myomata alone.

In regard to Dr. Oastler's question relative to high voltage x-ray, I would say that we are not yet prepared to express an opinion. The apparatus has been in use in our clinic only during the last year and a half and Dr. Pancoast, who has been in charge of this work, is not willing to express an opinion one way or the other as to the value of the high voltage treatment. Personally, I am very dubious about it. Patients are very much upset by the nausea and vomiting that they sometimes experience and it is often most alarming. If there is to be a permanent result on the cancer, however, the temporary discomfort of the patient is not to be considered, but I am still of an entirely open mind as to the advisability of such a procedure.

In reference to Dr. Geist's question regarding the x-ray of the spleen, considerable has appeared especially in the German literature, as to the advisability of splenic irradiation and as to the results that may come from it. I think it is a rather difficult matter to determine exactly the cause of this bleeding; in other words, to determine whether it is uterine or endocrine. I think most of it is endocrine. Polano years ago brought out the fact in his excellent study that we cannot demonstrate anything in the uterus, either in the musculature, the endometrium, or the blood-vessels that in any way differs in the bleeding and the non-bleeding uterus. He believed (and I think he was right) that it was due to some alteration in ovarian secretion or some upset in balance between the secretion of the ovarian or other internal secretion glands. We have not used splenic irradiation except in one case of purpura, but what the result will be it is too early to say.

DR. HERMANN GRAD presented a paper entitled **End Results After Operation in 53 Cases of Uterine Prolapse**. (For original article see page 163.)

DISCUSSION

DR. RALPH WALDO.—There is one criticism I would make, I do not believe that any of us would state that procidentia starts after the climacteric period unless we have examined the patient beforehand, for in a large percentage of cases there is more or less first or second degree procidentia, where the patients take no notice of it. Many of these women only recognize that they have what they call "falling of the womb" when it comes out, and you might have a first or second degree procidentia and it might develop long before the climacteric is reached and still it would not appear in the history.

DR. J. M. MABBOTT.—This is practically a clinical study of Dr. Grad's cases from his own standpoint.

To classify labors as normal or abnormal from the standpoint of instrumental delivery or not is very unsatisfactory. A good many cases get through without forceps long after they cease to be normal cases and should have had forceps, and I have always thought that where forceps are unnecessary they are harmless.

DR. JOSEPH BRETTAUER.—I appreciate the amount of work which this paper represents, but the results are not conclusive. As shown in Table IX, of the

small number of cases reported, twenty had not been observed even as long as one year; furthermore, in compiling statistics of this kind, the personal element often predominates, as a recent experience of my own clearly shows. In our Follow-up Clinic a case was brought to my attention in which the final result was recorded as perfect by one of my associates, whereas I would pronounce it as only moderately successful. The value of statistics would be greatly enhanced if the final results were reported after an examination of the cases by two or three disinterested colleagues.

DR. H. N. VINEBERG.—I would like to ask why Dr. Grad found it necessary to operate on so many cases in the first degree of prolapse, whether there were very marked symptoms so that an operation was indicated. A very slight prolapse in a young woman I should rather not consider an operative case at all.

DR. F. A. DORMAN.—I likewise agree that for the complete story we should know the types of labor and delivery. Of course, we must assume that Dr. Grad did not have these statistics at hand. These cases of procidentia, of course, are marked as failures in an obstetric "follow-up." It is important to know whether we fail by interfering with forceps in these cases or whether we interfered too early, or whether we delayed too long and did not apply our forceps soon enough. From my own personal observation it seems that many cases of procidentia occur in protracted labors in which there was no application of forceps and the fact that forceps were used proves nothing.

DR. HERMANN GRAD.—I fully agree that these procidentias in climacteric cases probably occur long before they cause symptoms and come for operation. The patient is asked how long she was troubled with the procidentia.

As to Dr. Brettauer's remarks about how the percentages of operations are obtained, I would say that the figures are obtained by taking a certain number of operations in a certain number of cases, of first, second or third degree of prolapse, the figures show that practically the average number of operations was about the same for all three degrees of prolapse.

I will answer Dr. Vineberg about the first degree of prolapse operations simply by saying that every one of those cases had definite symptoms. Even though the prolapse was a first degree prolapse the patients had symptoms with cystocele, rectocele, or the cervix coming down to the vulva.

I also agree with Dr. Dorman that we haven't enough statistics to be able to tell definitely about instrumental or noninstrumental delivery. All we have in these cases is whether they are delivered with instruments or not, and the study shows that instrumental delivery does not seem to have anything to do with procidentia uteri.

THE NEW YORK OBSTETRICAL SOCIETY

MEETING OF MARCH 11, 1924

THE PRESIDENT, DR. FRANKLIN A. DORMAN, IN THE CHAIR

DR. HIRAM N. VINEBERG presented the following case reports: (1) **Septic Thrombophlebitis of the Left Ovarian Vein Complicating a Fibroid Growth of the Uterus.** (2) **Septic Thrombophlebitis of Right Ovarian Vein Following Curettage of a Non-Pregnant Uterus.**

(1) C. S., a spinster, aged forty-five, a highly intelligent principal of one of the public schools in the City consulted me first on Nov. 16, 1921.

She stated she had not been quite well during the entire summer. She felt nervous and tired most of the time and attributed her poor health to the strain of having to take care of her bedridden mother. She had not resumed her school duties as she wished to rest and regain her strength. For the two or three weeks prior to coming to see me she suffered from what she termed uneven temperatures, having hot and cold spells (these were chills and fever as was revealed later) but paid little attention to them, looking upon them as symptomatic of the beginning of the change of life. For several weeks her left lower extremity would swell during the day but the swelling would disappear on rest or when in bed during the night. Had pain off and on in her right arm which she still felt at times. There was a feeling of weight in the lower part of the abdomen, but no definite pain. Five years before she suffered from menorrhagia. At that time a fibroid polypus was detected and removed *per vaginam*. Since then the menses had been regular, of normal amount and duration, lasting from four to five days,—no clots, no pain.

The patient was stout, above the average height with a marked sallow complexion. The pulse was 84, of good quality, the temperature normal and the urine was free from albumin and sugar. On examination a hard slightly nodular tumor was found filling rather snugly the whole of the lower half of the abdomen. The cervix passed into the tumor mass which seemed moderately fixed.

The diagnosis was made of multiple fibroid tumor of the uterus with pressure symptoms. Operation was advised and accepted. She entered the Flower Hospital, Nov. 20. On admission her temperature was 100.4° and pulse 100. Next morning the temperature was normal. That afternoon at 2 P. M. however, she had a severe chill lasting thirty minutes, which was followed by a temperature of 105° pulse 128 and respiration 40. Shortly afterwards Dr. Morris Manges made a most careful and thorough examination with practically negative results. A blood count showed leucocytes 28,400, neutrophiles 94 per cent, lymphocytes 6 per cent, no plasmodia. The urine showed a faint trace of albumin. At 8 P. M. the temperature had dropped to 100.8°, pulse to 100 and the respiration to 20. At 9:45 she had another chill of less severity. The temperature rose to 103°, pulse to 136 and the respiration to 24. November 22, 8 A. M., temperature 102°, pulse 100, respiration 24.

I learned now on closely questioning the patient that the uneven temperatures to which she had referred when taking her history in my office, were distinct chills lasting from 10 to 20 minutes and were followed by fever, how high she did not know. She stated she had had four such attacks during the prior two weeks. The

inference was now forced upon me that some acute process must be going on in the tumor, either necrosis, suppuration, or what was more probable, a red degeneration of one or more of the nodules, and that surgical intervention should not be further delayed. Accordingly, about 2 P. M. of that day when the temperature was nearly normal, I performed a panhysterectomy, removing the tumor, cervix and adnexa *en masse*.

When the abdomen was opened it was noted that one of the fibroid nodules, the size of a tangerine orange, made the impression of being the seat of red degeneration and hence, doubtless the cause of the chills and fever. In this we were mistaken, as subsequent events proved. The sigmoid was quite extensively adherent to the left infundibulopelvic ligament. When the adhesion was separated sufficiently to expose the left ovarian vessels it was noted that the peritoneal covering was of a dirty gray color and moderately infiltrated. While the condition was recognized by me at the time as something unusual and as far as my experience went, I did not deem it wise, under the circumstances, to make any further investigation but to remain content to apply a ligature around the vessels as high up as I could.

I was especially loath to prolong the operation, inasmuch as considerable technical difficulties had been encountered owing to the very thick abdominal walls, the great abundance of peritoneal fat and the tight fitting of the tumor in the true and false pelvis. The difficulties were very much enhanced by the poor anesthesia, the patient developing deep cyanosis so that the operation had to be stopped a few times until the cyanosis grew less. Nevertheless, the operation was completed in an hour and a quarter, with practically no loss of blood. There was apparently very little shock and the patient reacted very satisfactorily.

A gross and microscopic examination of the tumor showed no changes other than thickening of the walls of the blood vessels. Both ovaries showed evidences of a chronic inflammatory process and the left ovarian vein was occluded by a thrombotic clot.

Nov. 23. First day, 8 A. M., T. 98.6°, P. 92; at 8 P. M. T. 99°, P. 100, R. 24. At 9 P. M. had a chill of five minutes followed by a temperature of 101°, pulse 116. Nov. 24—second day postoperative, 8 A. M., T. 99°, P. 92, R. 24; 8 P. M., T. 101°, P. 116, R. 24.

As the pathologist's findings in the tumor did not explain the chills prior to the operation and the recurrence of the chill after it, an x-ray was taken of the teeth. This the dentist thought showed evidences of infection of two of them. These he extracted the next day. On macroscopic appearances the roots seemed fairly normal. Cultures, however, taken from them showed streptococci.

November 25: 3rd. day postoperative, 8 P. M., T. 100.6°, P. 108, R. 24. The patient had a comfortable day. No distention; passed flatus freely.

From this day on until the exitus on the twenty-fourth day patient had one or more chills daily with temperature varying from 98° to 105°. During the period of low temperature she was bright and looked as if there was nothing the matter with her and said she felt very well, but with the rise of the temperature she became very restless, moaned considerably and was more or less delirious.

The sutures were removed on the tenth day. There was perfect primary union. On bimanual examination no exudate was to be felt in the pelvic cavity or lower abdomen. There was, however, a profuse purulent discharge escaping through the left side of the vaginal opening. A blood culture was taken Nov. 29, seven days p. op. and again Dec. 12, nineteen days p. op. Both were negative.

On the recurrence of the chills after the operation, I reached the conclusion there was a septic thrombophlebitis of the left ovarian vein which was extending upwards and that the only chance the patient had lay in reopening the abdomen and excising the affected vein.

With this in view, various consultations at different times were held. After some discussion with each I gained a concurrence with my diagnosis, but none would agree to my proposition of surgical intervention. Each one expressed the confident view the patient would recover with the general treatment that was being carried out. It is only fair to say that each consultant happened to see her in the nonfebrile stage when she was placid and apparently in good condition. The last two days there was constant delirium. The temperature rose to over 106° , pulse to 130 and more, and she finally succumbed on the twenty-fourth day after operation. A couple of days before exitus a small patch of bluish purple discoloration appeared over the inner surface of the large toe of the left foot. It had a fairly defined line of demarcation.

Autopsy examination showed the left ovarian vein for three inches above its ligation was about the size of the thumb and the seat of a purulent thrombus. Beyond this to its entrance into the left renal vein it was patent and normal. The wall of the left iliac vein on section was found thickened in sections and contained a soft clot. A polypoid vegetation one inch across at the base and nearly one inch in height was found on the left mitral valve. The usual evidences of general sepsis were found in the kidneys and spleen.

The impression gained on witnessing the autopsy was very strong that had I been permitted to carry out my advice as soon as the chills recurred after the operation, in all likelihood the patient would have recovered.

One element of doubt presented itself in the discovery of the mitral polypoid vegetation. It was not easy to determine whether this was primary or secondary to the vein affection. Most likely the latter.

The two very competent internists who examined her, the one only shortly before the other a few days after the operation, detected no evidences of heart lesion.

I have had a fairly thorough search of the literature made and no similar case was found.

(2) On January 7, 1924, a physician brought to my office for consultation, a very large, stout woman with pale mucous membranes. She was forty-four years of age, married twenty-three years, had five children, the last seven years ago, and two miscarriages.

For some time past the menses had been very profuse. She had now been bleeding steadily for three weeks and was passing large clots, with cramp-like pains. The uterus was enlarged 100 per cent and felt quite hard. The cervix was large but not lacerated and presented no erosions. The adnexa were not palpable.

A diagnosis was made of fibrosis uteri but the bleeding was so profuse that one had to think of a probable small submucous fibroid. Of course adenocarcinoma could not be definitely excluded.

I expressed the opinion that if one could eliminate the presence of a submucous fibroid or adenocarcinoma, it would be a suitable case for radium treatment. Hence a curettage should first be done and if the material obtained proved nonmalignant, then one could apply the radium.

Jan. 19, twelve days later, the same physician asked me to come to see the patient at her home. I learned from him that he had curetted her on Jan. 8, (11 days before) that she had a severe chill on the next day followed by a temperature ranging from 102° to 104° and a pulse from 100 to 120. He stated that two or three days later he dilated the cervix with uterine dressing forceps and that a fairly large quantity of purulent fluid escaped. The temperature then gradually fell to normal where it remained for two days, but on the morning of the day I was called the patient had another severe chill and the temperature rose to 104° , pulse 120. I found the patient looking very ill, the tongue heavily coated with a white fur, the abdomen moderately distended but not rigid. On bimanual examina-

tion the uterus was found as on the previous examination. There was no exudate to be made out nor any point of distinct tenderness.

The impression gained was that in all probability an infection had occurred either of a submucous fibroid, or of the endometrium. The patient was admitted to the hospital for observation and treatment. On the following morning the patient looked less ill than the evening before. The tongue was not as dry or as heavily coated. Temperature 100°, pulse 90. There were no signs of general peritonitis. The blood showed 70 per cent hemoglobin; 3,886,000 red cells; 9,400 white blood cells; 80 per cent polynuclear.

In view of what had taken place before and the uncertainty of the pathologic condition present, I concluded it would not be wise to wait any longer for surgical intervention. Accordingly, on the afternoon of the following day, Jan. 22, I performed a panhysterectomy, removing the uterus and cervix and adnexa *en masse*.

The right ovarian vessels were found infiltrated, forming a mass the thickness of the thumb. The swelling extended apparently as high as the vena cava. After removing the uterus and adnexa I directed my attention to the affected vein. I found it impossible to shell it out from its bed, so intimately blended was it by exudate with the adjacent tissues. I, therefore, incised the wall of the vessel and the peritoneum covering it, and shelled out the semisolid and purulent clot which reached almost to the vena cava. I then sutured together the walls of the vessel and inserted a narrow strip of iodoform gauze into the canal thus created, carrying the free end into the vagina. The peritoneal and fascial layers were closed in the usual way, a strip of iodoform gauze was placed at the bottom of the fat layer and the edges of the skin coated by sterile adhesive strips.

The pathological report showed the uterus the size of six weeks' pregnancy, 12 cm. x 10 cm. x 8 cm. Upon section numerous minute foci of suppuration were visible.

Microscopic examination of uterus showed a polyplastic infiltration of all the coats of the uterus, polynuclear and round cells predominating. The endometrium was sloughed in some areas. Throughout the muscle wall were numerous microscopic abscesses. Both the mucous membrane and muscle wall showed occasional areas of necrosis. Examination of specimen from thrombus showed the usual structure but with extensive infiltration of round cells and polynuclears. Section from tubes showed infiltration of all coats with round cells and polynuclears: section from both ovaries showed round cell infiltration.

Diagnosis.—Acute suppurative endo- and myometritis: purulent thrombophlebitis, and acute salpingoophoritis.

The convalescence was not what might be termed stormy. At no time was there any reason for grave anxiety, but it was slow, with more or less fever. The fat layer did not suppurate but was tedious in healing and for a time did not look very healthy. However, its condition was not such as to account for the temperature. The kidneys and heart were negative. There was no exudate. The temperature persisting, I thought there might be some retention in the lumen of the sutured vein. With two fingers as a guide, I carefully passed a long uterine dressing forceps into the track left by the gauze drain and dilated gently, no pus or fluid of any kind escaped.

The temperature and pulse were practically normal on the 9th day and remained so for nine days. Then the temperature ranged from 99° to 101.3° for the following 10 days and the pulse between 84 and 90.

As the patient was very anemic and was not responding to injections of cacodylate of soda, I thought convalescence would be expedited by a blood transfusion. This was done on the thirty-fifth day. It was followed by a very severe chill and temperature rise to 104°. It took four days before the temperature again became

normal. The patient from then on gradually improved and left the hospital on the forty-seventh day in fairly good condition.

The abdominal wound was practically healed. She was free from pain and the examination of the pelvis and abdomen was negative as it always had been subsequent to the operation.

Septic thrombophlebitis is, as we all know, not an infrequent occurrence following a curettage of a pregnant uterus, but this was the first case in my experience, as well as I can remember, in which it followed a curettage of a nonpregnant uterus.

DISCUSSION

DR. HIRAM N. VINEBERG.—Whenever the question of ovarian thrombophlebitis has been raised heretofore and cases reported, it usually excited discussion.

DR. HALSEY J. BAGG (by invitation) presented a paper on the **Etiology of Certain Congenital Structural Malformations**. (For original article see page 131.)

DISCUSSION

DR. HAROLD BAILEY.—It seems to me that here we may have some clue to the injuries that we see so commonly as birth abnormalities and which are more frequent than we ordinarily believe. It is only necessary to review hospital statistics for the period of a year to learn the number of gross abnormalities leading to death that exist in a hospital service. One hospital service of 1300 deliveries had seven and, if we go back to Potter's report, in 1113 deliveries there were 9, probably the largest number of gross congenital abnormalities that has ever been recorded in such a small series.

We have been particularly interested in this problem from the standpoint of irradiation. We knew from clinical reports, as well as from the actual findings, that a woman with the fetus in her could not be irradiated with any surety of thereafter getting a normal child, and, of course, those cases that have been, by accident, so irradiated have received the treatment from the standpoint of enlargement of the uterus ascribed say, to fibroids. One report from abroad and a case reported by Dr. Little, in a discussion before the American Gynecological Society last year, stated in both cases that the fetus at the time of birth was alive but very much stunted, that it failed to develop in a natural manner and that it had the brain of an imbecile.

Of course, we have felt that irradiation of the parent would have considerable significance, and these experiments demonstrate that at least in mammals of the lower order this is true. From a clinical aspect these facts prevent us from treating women who have myopathic hemorrhage with a dose of radium that will keep them from flowing by affecting the ovaries for a certain length of time; we must treat them to absolute sterility. Therefore it seems to me that this experiment really has a practical bearing for us, as well as being of the greatest interest from the standpoint of the consideration of hereditary factors.

DR. I. C. RUBIN.—I would like to ask the doctor whether he would be good enough to compute for us the amount of x-ray or radium that would be equivalent to get a similar effect in a woman. In other words, if this is of value to us as clinicians, we ought to know how much of a dose would be safe.

The work is valuable to us in two ways,—for example, I remember an obscure case of pregnancy where an ovarian cyst or a fibroid was in question, complicating a pregnancy of more or less normal advancement where I suggested that an x-ray picture should be taken to clear up the diagnosis. Two consultants on the case, however, expressed it as their belief that the x-ray exposure for the purpose of getting a radiographic picture would have a lethal effect upon the fetus, and that,

therefore, I would be subject to criticism. I feel pretty certain today as I did then, and particularly from listening to Dr. Bagg's wonderful report, that a mere two, three, four, or five second's exposure of a pregnant uterus in the fourth or fifth month of gestation can have practically no effect upon the fetus either immediately or shortly after birth, or even later on in life.

The other point that we must bear in mind is the possible lethal effect upon organs, such as the eyes, kidneys, feet, etc., where women had been radiated for myopathic bleeding, etc. These may be young women, particularly in the stage of puberty and adolescence, who eventually get married and become pregnant. It is my impression that there have been a number of cases reported where there have been no abnormalities, although I am conscious of the fact, as reported by Dr. Bailey, Dr. Bagg and Dr. Matthews, that there are lethal effects. It would be well, therefore, if Dr. Bagg could tell us now, if possible, what the lethal dose for women would be, that might have its effect upon the fifth, sixth or eighth generations.

DR. JOHN O. POLAK.—Dr. Bagg's paper has filled me with a great deal of apprehension because in a total of 874 women of child-bearing age, radiated by us, there were 39 women who became pregnant. Out of that number there were 15 abortions. But 20 apparently normal babies born from these 39 pregnancies. These babies have been followed, and we have follow-up notes of these babies ranging from 2 to 5 years, and their health and development seems to be normal.

The doctor has suggested that the children and grandchildren will have these abnormalities. Now, the point that Dr. Rubin brought out is a very important one. Dr. Reuben Peterson was here recently and converted us to the idea of x-raying the pregnant uterus for diagnosis in obscure cases. He made the frank statement that after several years of work with the x-ray for diagnosis of pregnancy there have been none of these lethal effects observed, and I agree with Dr. Rubin that this paper suggested two very important things. First, what dosage is safe? Second, are these children whom we have followed up to this point liable to have children or grandchildren who will be abnormal?

I would like to report the case of a woman who was five months pregnant with inoperable cancer of the uterus that was growing very rapidly, on whom we used a very large exposure of radium. This woman went to term and had a section done and the child was a normal child.

DR. HAROLD BAILEY.—I would like to ask Dr. Bagg if he would express an opinion about the use of x-ray for diagnostic purposes in regard to pelvic measurements, during the first two months of fetal life.

DR. W. P. HEALY.—One point we must bear in mind is that Dr. Bagg in his experimental work radiates presumably a normal animal or a normal structure to bring about an abnormal condition. He is definitely experimenting to see if he can, starting out with something normal, produce something that will be abnormal; in other words, if some injury will result. We must bear in mind that women subjected to radiation have pathology to begin with, in the generative tract, otherwise we would not be radiating them, and if they have a pathologic defect in the uterus there is no reason whatsoever why they cannot have a pathologic defect in the ovary, or ovaries. Therefore, just because we will say that of these 39 women who did conceive after radiation in the series quoted by Dr. Polak there were 15 abortions, of course that is in no sense a reflection upon the use of radium, nor would it seem to indicate that possibly the abortions were the result of some injury to the ovary or the uterus in the application of the radium. The women who had abnormal uteri might not develop normal decidua; they would be apt to abort. In the same way they may have abnormal graafian follicles, so that we cannot necessarily compare,

it seems to me, the final results in these cases with the conditions that are brought about in the experimental work of Dr. Bagg.

Then, again, one point that impressed me in one of the charts was the apparently tremendous amount of inbreeding in his series. Of course, we all know that Dr. Bagg in reporting these results to us has controlled them by a similar series, probably in normal animals, inbred in just the same way and not exposed to irradiation, but, nevertheless, that is a point I would like to have him take up in the final discussion, as to why the inbreeding in itself might not bring about a defect that once got started in a normal animal.

DR. HERMANN GRAD.—About fifteen years ago one of my patients had a sarcoma in the abdominal wall. There was a recurrence after a few months and the patient was subjected to very severe radiations, so severe that for two and a half years she did not menstruate. I thought she was permanently sterile after that, but later she began to menstruate and became pregnant and had a normal female child that is now about 13 years old and is perfectly healthy.

DR. F. A. DORMAN.—I would like to ask Dr. Bagg whether he has made any study of the possible effect of the x-ray radiations on the placenta, to determine any possible relation to the hemorrhagic conditions in the fetus.

DR. HALSEY J. BAGG.—In regard to Dr. Rubin's question as to the amount of x-ray radiation used, I would say that the total dose in the 12-second experimental exposures amounted to about one-fifth of the human erythema dose. It is very difficult indeed to translate this experimental dose into the clinical doses that are being used every day. I must plead ignorance here at the very beginning, concerning what might be called a "safe" clinical dose, in the sense which you require and in the light of the experimental work I have presented this evening. The Hertwigs in their work with the lower vertebrates showed that while large doses of radium irradiation tended to produce death of the developing animals, milder doses were more apt to produce gross morphological abnormalities that were not incompatible with life.

In regard to the questions concerning the use of x-rays during the fourth or fifth months of pregnancy, I would say that a single exposure at such a period, would not, in my opinion, be likely to produce abnormalities in the mother or child, but that is, of course, still open to a good deal of investigation. The reason I mention this point is because I want to emphasize the fact that irradiation during the early developmental period, the first days or weeks of embryonic life, is more likely to produce abnormalities than irradiation later on. I am quite sure of this point. After the various organ systems have been completed and a considerable part of their differentiation is attained, then the disturbing reactions due to irradiation are apparently more likely to be upon the germ cells, which are still greatly underdeveloped, or possibly upon the endocrine organs. In this regard I do not want to make Dr. Polak more apprehensive than he is, but I would say that while the children he mentioned were born apparently normal after irradiation *in utero*, and do not show developmental disturbances of a gross order to the present date, still it is well to be on the lookout for the possibility of future abnormalities, sterility, etc.

In regard to Dr. Healy's remarks concerning the possibility that the experimental abnormalities in my animals were due to inbreeding *per se*, I would say that I do not believe that the inbreeding itself produces these abnormalities. Speaking from a biological point of view, there is considerable evidence, which it would not be worth your time at present to go into, which substantiates me on that particular point. I refer particularly to the extensive experiments of Dr. King, of the Wistar Institute. I have in my own laboratory a very closely inbred strain of albino

mice which I have kept for the last eleven years. The animals are normal, healthy and active. They apparently have never shown any sign of a hereditary defect that I could make out and I have purposely killed many of them to see if there were any abnormalities cropping up in the young *in utero*, or at birth. I am sorry that I cannot answer Dr. Dorman's question concerning the direct irradiation of the placenta. Irradiation of the entire animal *in utero* apparently did not affect the placenta if the treatment was given towards the end of pregnancy. Irradiation during early pregnancy produced a definite effect on the placenta and usually death and abortion of the animal.

NEW YORK ACADEMY OF MEDICINE SECTION ON OBSTETRICS AND GYNECOLOGY

MEETING OF FEBRUARY 26, 1924

DR. EDWIN W. HOLLADAY IN THE CHAIR

DR. MORRIS A. GOLDBERGER reported a case of **Retention of Urine Due to Postpartum Parametritis.**

Mrs. R. S., age twenty-four, was admitted to Mount Sinai Hospital, on Nov. 21, 1923. Chief complaint retention of urine following childbirth eight weeks previously, fever and chills for two weeks. Never seriously ill or operated upon. During her pregnancy there was some urinary frequency. She had one spontaneous miscarriage at three months, 1½ years ago.

Menstrual history normal up to her recent pregnancy which was terminated by an instrumental delivery. Her bowels were always constipated. Since delivery she had to be catheterized daily. At times she has had involuntary dribbling of urine. For two weeks before admission to Mount Sinai Hospital she had an irregular temperature and chills and in the last twenty-four hours vomited all solid food. Physical examination showed a well-developed woman, with flushed cheeks, feverish and rather acutely ill. The teeth were in poor condition, tongue coated and moist. The tonsils were large and red, and the pharynx was congested. The neck showed a slight fullness in the thyroid area. The abdomen showed a separation of the recti muscles, was soft and relaxed. Slight tenderness could be elicited in both lumbar regions on percussion. There was no enlargement of the liver or spleen. The kidneys were not palpable. The lower abdomen showed the usual evidences of a recent pregnancy. Forty-eight ounces of urine were obtained by catheter. The vagina was relaxed. The cervix pointed forward. The uterus was slightly enlarged, retroflexed and limited in mobility. The adnexa were palpable. In the anterior pre-cervical connective tissue there was a dense infiltration about 3 cm. in diameter that extended across in the anterior pre-cervical space. The blood counts showed a leucocytosis of about 21,000 with a low poly count. The blood culture on November 25 was sterile and the Wassermann was negative. The urine showed 2+ albumin and contained many white blood cells in clumps.

Cystoscopy (11/27/23) showed the bladder to be intensely inflamed and covered with exudate. Both ureters were catheterized and practically clear urine obtained. Weak i. c. excretion from both kidneys. There was a bladder residual of 30 ounces+. Aspiration of the exudate *via* the anterior vaginal wall was negative. Microscopic examination of the ureteral specimens showed both sides to contain many white blood cells. The urea on both sides was 1.1 per cent. The P.S.P. was 23

per cent in two hours. An x-ray examination of the genitourinary tract showed both kidneys to be enlarged, normal in contour and no evidence of calculi.

A permanent catheter was introduced, the temperature gradually came down from 105° to 99° in 10 days and on the 19th day the catheter was removed. The temperature only rose to 101.8° on the 23rd day, after the patient was up. She was catheterized every six hours the residual being about 8 ounces and on discharge only 4 ounces. The exudate in the anterior parametrium on discharge practically disappeared and the patient was referred to the out-patient department of the hospital for further treatment. She was last seen in the out-patient department on January 23 and still had a residual of 3 ounces.

The cause of the retention of urine in this case was probably due to the exudate that was present in the precervical connective tissue. Its mechanism may be explained in several ways. Von Rosthorn's explanation is that of fixation of a portion of the posterior bladder wall as a result of the inflammatory infiltration, thus preventing the bladder wall from contracting completely,—hence retention. He also states that if the exudate is very hard it may cause retention by pressure, producing an obstruction. The latter view I think would necessitate a much larger exudate than was present in this case. Another explanation for this retention is based on the physiology and anatomy of the urinary bladder. The nerves of the bladder are derived from the pelvic plexus of the sympathetic and from the 3rd and 4th sacral nerves, the former supplying the upper part of the organ and the latter the base and neck. Fibers passing by way of the nervi erigentes when stimulated cause contraction of the bladder and inhibition of the sphincter. The fibers supplied by the hypogastric plexus cause relaxation of the bladder muscle and tonic contraction of the internal sphincter. The nervus erigentes innervates the bladder near its neck, whereas the sympathetics do so higher up on the posterior surface at about the level of the precervical space. In this case the exudate was situated in this region and possibly involved the sympathetic nerve supply, thereby causing the functional disturbance described. While I have no positive evidence that this occurred in the case reported, yet the anatomical relationships as obtained from standard texts on anatomy and the physiology of the bladder are in favor of this explanation.

The cystitis present on admission to the hospital was probably due to infection as a result of frequent catheterizations, and not to an interstitial cystitis. The latter produces a contracted bladder of small capacity that bleeds easily. The temperature was most likely augmented by an associated pyelonephritis as a result of retention and possible ascending infection.

DR. WILLIAM P. HEALY described a case of **Incarcerated Pregnant Retroflexed Uterus Due to an Ectopic Kidney.**

R. H., seen in consultation Nov. 17, 1922, age thirty, married seventeen months, no children, no miscarriages, general health excellent, appendectomy four years ago, no complications, menstruation every four weeks, three to five days' duration, moderate in quantity, no pain, last period July 22.

Present Illness.—Patient is in fourth month of pregnancy, and has been very well until two weeks ago, when she began to have difficulty in voiding urine, and for past three days has had to be catheterized. Although the patient was catheterized every eight hours, two to three pints of urine were obtained each time. For the past three days, she has had a great deal of suprapubic pain and distress. Bowels constipated, no chills or fever.

Examination.—Rather pale, but well-nourished woman of average height, heart and lungs normal, abdomen markedly distended below the umbilicus by a smooth cystic tumor, which on catheterization, proved to be a distended bladder containing

three pints of turbid urine, no fetal heart could be heard, nor could any fetus be palpated. Vaginal examination showed a bulging cystic tumor filled the culdesae, and pushed it down almost to the vaginal orifice, compressing the posterior vaginal wall against the rectum. The cervix was displaced so high in the vagina that it could not be reached by the examining finger. The entire pelvis was choked by this tumor and the uterus could not be outlined.

A tentative diagnosis was made of intraligamentous ovarian cyst, complicating pregnancy, and it was assumed that the rapid growth of the cyst had displaced the uterus to the front and interfered with micturition.

An abdominal operation for the relief of the condition was advised.

Patient was admitted to the Roosevelt Hospital, and the vaginal examination under an anesthetic revealed instead of the intraligamentous ovarian cyst, a retroflexed incarcerated pregnant uterus, which was impossible to replace. A median suprapubic abdominal incision was therefore made, and on exposing the pelvis, a somewhat crescent-shaped cystic tumor, the size of a small grapefruit, was revealed, just below the promontory of the sacrum and behind the peritoneum. This was identified as a displaced left kidney, the right kidney was normal in size and position. The uterus was sharply retroflexed and firmly incarcerated in the pelvis, and was released with considerable difficulty, and brought into its proper position.

As patient desired that every effort be made to save the pregnancy, no further operative procedure was undertaken at this time. The abdominal wound was closed, and patient returned to bed in good condition.

Patient aborted within twenty-four hours, a four-months' fetus with placenta and made a normal convalescence from both the operation and abortion.

At the time of the operation, the urinary bladder was so enlarged that it reached within one inch of the umbilicus when empty, and its walls were markedly hypertrophied, showing a huge mass in the lower abdominal zone.

During patient's convalescence, the bladder gradually returned to normal in size and the cystitis which was very marked before the operation gradually cleared up. During the first two weeks, there was a good deal of dysuria and inability to void. She was discharged from the hospital December 23, and the pelvic examination revealed a retroversion of the uterus and the ectopic kidney was readily palpable just below the promontory of the sacrum. Patient was advised to return to the hospital for nephrectomy and suspension of the uterus.

Jan. 4, 1923: Cystoscopic examination disclosed good bladder tolerance and capacity, and the mucosa, trigone and ureteral orifices normal in appearance. The right orifice was observed discharging urine into the bladder at regular and frequent intervals. No motion observed at left orifice. Catheters pass to either renal pelvis readily. No obstructions noted. No residual urine in right pelvis. Urine is clear in gross appearance. Phloridzin test strongly positive in twenty minutes. One ounce of residual urine obtained from left renal pelvis by aspiration. After this, the flow of urine was very slow and irregular. Urine is clear in gross appearance. Phloridzin test shows a very faint reaction after thirty minutes. Cultures of urine from each side remain sterile at the end of forty-eight hours. Pyelogram shows left ureter curves to right beyond the midline, then back toward left entering the pelvis from above. The pelvis is dilated and distorted, lies across the upper portion of the sacrum and the junction with the ureter is at the upper aspect of the pelvis. The calices are enlarged and distorted. There is probably very little kidney secreting tissue left.

Jan. 6, 1923: Phthalein intravenously injected appeared in the urine in five minutes. The urine had been rendered alkaline by the use of sodium bicarbonate, and the right side was observed secreting a deeply red-stained urine into the bladder at regular and frequent intervals, the stream being of good size and force. Nothing

observed coming from the left ureteral orifice at any time during the examination. Pyelogram of the right kidney shows normal position, but some dilatation of the pelvis and ureter.

Jan. 15, 1923: Through a midline suprapubic abdominal incision, the displaced left kidney was exposed, the posterior layer of the peritoneum incised, and the kidney removed. The kidney measured $7\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{1}{2}$ cm. The pelvis was dilated and somewhat larger in size than the kidney. The abdominal incision was closed and the retroperitoneal area was drained through a posterior colpotomy incision. On section, the cortex of the kidney was diminished and pale, medulla sacculated. Patient made a normal convalescence.

Patient again conceived in July, 1923, and up to the present time (February, 1924), pregnancy has progressed normally.

DR. HEALY also reported two cases of **Myosarcoma Complicating Adenocarcinoma of the Corpus Uteri.**

In the two cases herewith discussed, we have myosarcoma apparently arising in a fibromyoma and in each instance associated with adenoma destruens (adenocarcinoma) of the corporeal endometrium.

It seemed worth while to report these two cases of myosarcoma because of the multiple malignancy in each case and because sarcoma of the uterus is an infrequent disease; in fact, while the statistics of different investigators vary somewhat, very few of them suggest a ratio greater than 1 to 2 per cent.

In a study of 1479 cases of fibromyoma uteri operated upon at the Roosevelt Hospital from 1910 to 1922, only two cases of sarcoma were found, and Le Roy Brown reported a review of fifteen hundred cases of fibromyoma of the uterus, from the Woman's Hospital, showing but seven cases of sarcoma. The majority of the cases seem to occur during the fourth and fifth decades of life.

Microscopically, the tumor may be of round, spindle, or mixed cell type. Those that arise from fibroids are usually encapsulated to a large extent, whereas those that arise from uterine musculature are bound to be more diffuse. Symptomatically, it is difficult to recognize sarcoma of the uterus, for the symptoms are identical with those of carcinoma of the uterine body, or necrosis of a submucous fibroid, the chief symptoms being irregular, profuse bleeding, with a semipurulent discharge from the uterus, and very often a condition of pyometra is found.

1. E. S., age forty-seven, married, no children, no miscarriages. Menstruation began at sixteen, recurred every twenty-eight days, lasting three to five days, amount moderate. Menopause since 1921. Admitted to the Memorial Hospital, January, 1924.

Present Illness.—Since menopause, patient has occasionally noticed slight spotting of blood from the vagina. Three months ago, she began to have lower abdominal discomfort, and also a persistent, white vaginal discharge.

The uterus was curetted at this time, but after a short interval, pain and discharge started again. The tissue obtained at the operation was said to show no evidence of malignancy. The external genitals and the vagina were normal, cervix was thinned out, external os was about two cm. in diameter, and the cervical canal filled by a polypoid tumor, the lower pole of which blocked the external os. The uterus was about the size of a three months' gestation, rather soft and cystic in feel. The tubes and ovaries seemed normal and there was no evidence of infiltration in the parametria. On pushing the polypus up into the cervical canal, away from the external os, a large amount of grayish, chocolate-colored thick fluid with very little odor poured from the uterine canal.

A clinical diagnosis was made of pyometra, secondary to fibromyoma and possibly complicated by adenocarcinoma of the corporeal endometrium. Because of the pyometra, the polypoid nature of the tumor in the uterine canal, and the possibility of a cancer of the body of the uterus being present, all three of which conditions, we feel, are best treated surgically rather than by irradiation, a complete abdominal hysterectomy was the method of treatment advised and carried out.

Examination of gross specimen was as follows: The uterus is much enlarged, 14 cm. long by 8 by 6 cm., by a polypoid tumor which is irregularly lobulated, very opaque, well circumscribed, arising by a buried base from the myometrium. The surface is eroded and infiltrated by blood. The endometrial mucosa is eroded, the muscle of the uterus is moderately hypertrophied, the gross appearance is that of primary myosarcoma. Above the internal os, the entire endometrium is slightly thickened, roughened and superficially eroded.

Because of this report, the patient's entire pelvic field was irradiated three weeks after the operation with low voltage x-ray machine, and the tissues in the vicinity of the vaginal vault and base of the broad ligaments irradiated with the radium bomb per vaginam for 3000 millicurie hours.

C. H., age fifty-three, single, nulliparous. This patient was admitted to the Memorial Hospital February, 1918, with a history of menorrhagia and metrorrhagia, for which a curettage had been done, and a diagnosis of adenocarcinoma made on the curettings. Because of this diagnosis, the patient was referred to the Memorial Hospital for irradiation. The pelvic examination revealed an irregularly enlarged uterus about the size of a two and one-half or three months' gestation, with a normal cervix. A diagnosis of fibromyoma, complicated by adenocarcinoma of the corpus uteri, was made, and as the patient did not seem to be in very good physical condition, she was thin and anemic, it was decided that she should be treated by irradiation rather than by hysterectomy. Her treatment consisted of fifteen hundred mc. hours within the uterine canal above the internal os, filtered with six-tenths mm. of silver and a radium block applied in six positions externally about the pelvic girdle, for sixteen thousand mc. hours at a distance of four cm. with one-half mm. silver and two mm. lead filtration. There was no further bleeding from the uterus after this treatment, and in April, two months after the treatment, the uterus was said to be about the size of a two months' gestation.

Patient continued to be apparently well and symptom free from that time 1918, until Dec. 19, 1923, nearly six years later. She now complains of a feeling of fullness and discomfort in the lower abdomen. Examination revealed a uterus symmetrically enlarged to about the size of a four and one-half months' gestation, soft and cystic in feel and the cervix very small and hard. A diagnosis of pyometra was made and patient was advised to have a hysterectomy, which was done January 25, 1924.

On bisection of the uterus, after its removal, there was found a large pedunculated solid tumor of soft consistence, the lower two-thirds of which was necrotic and reddish-purple in color, the base yellowish-white, and uniform in appearance on its cut surface. Histologic examination revealed myosarcoma. In this case also, the operative procedure will be followed up by complete irradiation of the pelvic field with x-ray and radium.

DISCUSSION

DR. DOUGAL BISSELL.—It has fallen to my lot to see an unusual number of misplaced kidneys during my surgical career. I use the word misplaced instead of ectopic because the latter word means simply a kidney out of position, either acquired or congenital, whereas the former means a kidney congenitally out of position. I assume from Dr. Healy's description of the case that it is a misplaced kidney and not a displaced kidney.

My interest in misplaced kidneys began in 1908 when there came under my care a patient sent by the late Dr. Wm. T. Bull. He considered her condition to be one of pregnancy, seven months or more, complicated by a fibroid tumor resting in the posterior culdesac. Under anesthesia each surgeon unhesitatingly diagnosed the pelvic tumor as a kidney reaching the lowest point in Douglas' culdesac; its outlines were so distinct then that it was impossible to mistake it for anything else. As this kidney presented a formidable obstacle to the delivery of the child, it was determined to empty the uterus. The problem then was how to manage the kidney. After considering the matter carefully, I determined that if the kidney could be released and the ureter and blood vessels found long enough, an attempt would be made to fix the organ. This was accomplished with success and a report of the surgical technic adopted then can be found in the Transactions of the American Gynecological Society, 1911, in connection with the history of two other cases. The third case I replaced was in some respects like that reported by Dr. Healy tonight. In Dr. Healy's case, however, the kidney was single, in mine it was double; in his case the kidney was placed immediately below the brim of the pelvis in the upper sacral region and as far as was known did not become a disturbing factor until after pregnancy; it occupied originally a comparatively small part of the true pelvis in a protected position and had a ureter very long. In my case the kidney occupied nearly two-thirds of the true pelvis anteroposteriorly, extended beyond the middle line, projected far above the brim of the pelvis and could be distinctly felt through the abdominal wall as a large tumor mass. Because of the presence of this large mass, the uterus was never able to assume an upright position, the only congenitally retroposed uterus I have met with. The uterus in Dr. Healy's case may have been retroposed when pregnancy occurred, but it was not incarcerated until its body had developed to a considerable size. Therefore if the retroposed pregnant uterus had been recognized early and corrected by manipulation or surgery, the pregnancy might have continued to full term and the injury to the kidney as the result of an incarcerated pregnant uterus could have been avoided. In my case the kidney mass, after severing the vessels passing to its lower half, or what should have been the left kidney, was lifted out of the true pelvis. The sacrifice of these vessels was necessary. As the result of the severing of these vessels, the lower half of which empties into the left ureter, ceased to function for several months but eventually did function. The patient married within the year after operation and passed through two successful unassisted labors within three years.

These three cases of misplaced kidneys are the only reported successful replacements of this type of congenital deformity which is evidence of the fact that the condition has been given scant attention from a conservative surgical standpoint. Many a woman has lost her life or sacrificed her kidney or undergone unnecessary surgical procedure because of the failure on the part of the surgeon to recognize this pathology. I am of the opinion that a large number of these pelvic kidneys can be saved if the surgeon will only bear in mind the possibility of their existence. Finally the diagnosis may be difficult or may be easy if one suspects the presence of a misplaced kidney. The x-ray will solve the problem.

DR. BARTON COOKE HIRST, PHILADELPHIA.—I have seen only one case of ectopic kidney. It never occurred to me that these kidneys could be so well replaced as Dr. Bissel has shown to be possible.

DR. HEALY (closing).—At the time of the first operation we did not know the function of the other kidney, and we did not remove the kidney at that time because we thought it perfectly safe to postpone this procedure until the patient had convalesced from the operation. After study of the functional capacity of both

kidneys, and finding that the ectopic kidney was functionally useless, we determined to remove it, even though it had a free ureter which would have made it possible to replace the kidney in normal position.

DR. JAMES TAYLOR GWATHMEY read a paper entitled **Painless Child-birth by Synergistic Methods.** (For original article see page 154.)

DISCUSSION

DR. BARTON COOKE HIRST.—I tried twilight sleep when it first came out in 1903, but had to give it up as there were too many cases of postpartum hemorrhage and too many asphyxiated babies. I took it up again as modified by Krönig and Gauss with more moderate doses of morphia and scopolamine, with the larger element in their method of suggestion. The patient, you know, is secluded; her ears are stuffed with cotton; the room is darkened and the obstetrician comments on what a wonderful thing twilight sleep is and how it relieves the patient of all pain. I visited Gauss and watched his method in operation. On one occasion I had two patients in adjoining rooms, one a hard-headed college woman and the other a woman of the mild, submissive type. It was interesting to watch the reaction of suggestion on both. The first said when I made the usual remark that "this is twilight sleep; a wonderful thing; she feels absolutely no pain": "It is not true. I am suffering intensely." The other woman looked surprised, startled and seemed to be suffering severely, but evidently thought the doctor knew better and she accepted the suggestion. After the labors were over, following the Gauss plan I repeated each day to these patients that twilight sleep was a wonderful thing and that they had passed through labor without suffering any pain. They both left the hospital convinced that they had suffered no pain. I use morphine and scopolamine still, but not routinely. I tried rectal administration of oil and ether some years ago but discontinued it. Later I thought that I had made a great discovery. Cannabis indica seemed to be the ideal drug for the control of labor pains; its first effect is to produce hilarity; the patient bursts out in a loud laugh and loses all sense of time and space, but it was a failure.

When I heard of Dr. Gwathmey's work I was much interested because his method promised to be practicable for the general practitioner. It is something that any doctor anywhere can employ. I think Dr. Gwathmey is on the right track. I shall adopt this system and try it out, for all new methods must be subjected to collective investigation to determine their true value.

DR. AUSTIN FLINT.—We all wish that we could efface the recollection of a painful childbirth and so care for the patient that she will approach another labor without great fear. The most satisfactory anesthesia that we have had so far for use in obstetrics has been a combination of gas and oxygen, supplemented with ether or chloroform while the child is actually being born. The method which Dr. Gwathmey has described appeals to common sense. It is a simple and rational method of diminishing pain, and the statistical reports show that the results are good in the majority of cases. The only thing that is needed is a possible modification. The attitude we should take is to extend to Dr. Gwathmey a helping hand by employing the method ourselves or by allowing Dr. Gwathmey to do it for us, or by using the procedure under his supervision. I should like to see it used in the hospitals with which I am connected. Any one who has listened to Dr. Gwathmey's presentation must feel that this form of synergistic anesthesia is sensible and practical. Its chief advantage is its simplicity. If we can have a simple routine consisting of giving 2 or 3 hypodermics, and then a colon injection, using drugs that can be purchased at the drug store, and can feel assured that the patient will have a painless time, the method will prove a boon to obstetrics.

DR. SAMUEL J. DRUSKIN.—I have used the method in fifty surgical and gynecological cases and in these it has worked excellently. There was no vomiting, pain or distention. Of six patients in whom cesarean section was performed two had bronchopneumonia; they had received ether from inexperienced internes. Since 1922, I have been trying the synergistic method in childbirth, and I have made use of various sorts of formulas. I have used 5 c.c. of a 25 per cent solution of magnesium sulphate. The method we now use is as follows: We give $1/6$ grain of morphine by hypodermic when the cervix is two fingers dilated; then scopolamine, $1/200$ of a grain with it and repeat this four or five times after a period of one-half to three-quarters of an hour. At the end of the fifth dose we give 150 c.c. of a 10 per cent solution of magnesium sulphate by hypodermoclysis. There are several things that we have noted, the most striking of which is the rapid dilatation of the cervix. Among the by-effects we see a slight edema of the face, the tissues seem to be more succulent and the capillary blood supply is greater than in cases that have not received the treatment. We have not completed our work as yet, but up to the present time this is the most recent formula that we have used. We have not used ether by colonic irrigation. I should like to ask Dr. Gwathmey why he does not increase the amount of magnesium sulphate he is using, because in our cases magnesium sulphate has not been deleterious.

DR. GWATHMEY (closing).—A system was adopted by which we finally arrived at the minimum dosage that gives the maximum results. Dr. Davis was not anxious to have us try any method in which there was an element of danger, and if we had introduced something that had given bad results that would have put an end to the experiments long ago. At first we selected our cases very carefully, taking those that would apparently go through labor normally. We begin by giving one hypodermic and then giving the instillation at a variable period of time, depending upon the effect. We gave two hypodermics of magnesium sulphate to a woman who had a contracted pelvis and then it was found that she had to be delivered. However, the medicine did its work, and she was relieved of pain. The question comes up when to withhold these drugs. The fact that a woman has a contracted pelvis and has to be delivered is no argument against the medicine. Why not use magnesium sulphate in obstetrics when it has proved itself useful in surgical anesthesia? At the Presbyterian Hospital they have used $3/8$ of a grain of morphine and 400 c.c. of a 4 per cent solution with no untoward results on over 200 cases; the patient comes to the table relaxed and ready for surgical operation; this medication is then supplemented with nitrous oxid-oxygen. The procedure just mentioned was painful and also required the attendance of a physician, although there were no accidents or sloughing. A surgeon in another part of the country who had tried this method modified it by giving $1/8$ of a grain of morphine in 2 c.c. of a 25 per cent solution and repeating twice, i.e., each patient gets $3/8$ of a grain of morphine and 6 c.c. of a 25 per cent solution of magnesium sulphate. He claims that this technic gives the same results as the 400 c.c. of 4 per cent solution of magnesium sulphate plus $3/8$ grain of morphine. If we get these results in surgical cases why should we not use this method in obstetrical cases? In developing this method I have in mind a man in the country who may not have an assistant or even a trained nurse. He can give this instillation and the three hypodermics and relieve pain. When ether is given by colon it does not have the effect that it does when given by inhalation. It does not cause nausea and gas distention. In a hospital in Huntington, West Virginia, oil-ether colonic injections have been given in over 2,000 cases. The surgeon operating there states that the reason he uses it instead of ether inhalation is because it does not produce shock as does ether when inhaled. The colonic instillation also produces analgesia almost twice as quickly as when inhalation is used. In painless childbirth one-half the amount

is used that is given by colon for surgical anesthesia. We have tried the method in enough cases to be convinced that there is practically no danger. In giving the colonic instillation air-bubbles must be excluded and one must always be sure that the lower bowel is clean. It may be that we have already arrived at the point where this method is as efficient as we can make it. We obtain analgesia and also amnesia.

I object to cannabis indica because one cannot rely upon the drug. Cannabis indica is as harmless a substance as we can add, but it is difficult to standardize, and one cannot rely upon its effects.

If anyone wants to try this method it is best to get someone who is acquainted with the technic to demonstrate it. We now have the method standardized to the extent that we secure 85 per cent success.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Extrauterine Pregnancy and Intraabdominal Hemorrhages

Lohnberg: Clinical Features of Ectopic Pregnancy. *Zeitschrift für Geburtshülfe und Gynäkologie*, 1921, lxxxiv, 404.

The author reviews 152 cases of extrauterine pregnancy operated in the Köln Clinic. The average age of the patients was 31.2 years. Twenty-four had never previously been pregnant; of these 10 were unmarried girls, 14 married women; 34 had had one previous pregnancy. The high percentage of nulliparae and primiparae speaks for the inflammatory and usually gonorrheal nature of the causation, which would lead in the more severe cases to complete or one-child sterility. An average period of sterility of 4.7 years preceded the ectopic pregnancy. Of the cases 67 were tubal ruptures, 81 tubal abortions and 4 growing, uninterrupted pregnancies. The author calls attention to the importance of the anamnesis, especially in regard to bleeding and pain, in the diagnosis, though frequently inflammatory adnexal disease may give exactly the same history. Bleeding appeared after an amenorrhea up to 3 months in 101 cases, the menses did not cease in 27 cases, intermenstrual bleeding occurred in 24 cases, there was no uterine bleeding in 16. In these latter, urgent symptoms due to rupture demanded operative interference before external bleeding, the sign of disintegration of the uterine decidua, could occur. These cases bled after operation. Pain resembled labor pains in many cases. It appeared before the bleeding in 31 cases, later in 17, simultaneously in 37. The location of the pain and the site of the pregnancy coincided in 89.5 per cent of the cases. The two sides were involved almost equally frequently. A clinical sign of some importance in the case of tubal abortion with hematocele is the appearance of a slight hemolytic icterus.

Repeated ectopic pregnancies were represented by 8 or 5.26 per cent of the cases, in 4 the other tube was macroscopically normal at the first operation. Of 67 laparotomies for tubal rupture, five cases died of hemorrhage, one died from an early eclampsia associated with the tubal pregnancy. Of 59 laparotomies for tubal abortion, none died; of 22 ovariectomies for tubal abortion, one died of peritonitis in spite of the evacuation of an infected hematocele. The author believes that so long as there is yet a spark of life immediate laparotomy should be performed in all cases of ruptured ectopic pregnancy. It is unsafe to wait for shock to subside. The reinfusion of the extravasated blood, after defibrination and careful filtration through gauze was performed in 14 cases. The author believes it is of the greatest value and in no case were there any untoward effects.

The later outcome is known in only 41 of these cases. Of these, 10 from the nature of their operation could no longer become pregnant. Of the remaining 31, 12 had later had intrauterine pregnancies or 38.7 per cent.

In this series of 31, only two had a second tubal pregnancy, that is the chances for a normal intrauterine pregnancy are about six times as great as for a repeated extrauterine. These results therefore justify conservatism in the treatment of the opposite apparently normal tube.

MARGARET SCHULZE.

Eerland: Extrauterine Pregnancy. *Nederlandsch Tijdschrift voor Geneeskunde*, 1924, i, 326.

The basis of this very detailed analysis are 116 cases. Of these 18 were treated conservatively, while 98 were operated, 92 by laparotomy and 6 by colpotomy. The fatal cases had all been subjected to laparotomy.

These were all received in a desperate condition and immediately subjected to laparotomy. In three of these cases abortion had been attempted and probably also in a fourth case, however peritonitis was the cause of death in only one of these. An attempt at abortion had been made in at least 7 other cases. Four of the fatal cases were *in extremis* when operated and in two of these the bleeding was still active at the time of operation. Active bleeding was encountered in 12 per cent of all operated cases. One patient died 5 days after operation (peritonitis).

Of the conservatively treated cases the diagnosis was considered certain in 10, almost certain in 6, and probable in the rest. Since exploratory puncture was abandoned some years ago, conservative treatment also has become less frequent.

Of 58 women in whom further pregnancy was possible, 30 later became pregnant one or more times (14 abortions and 35 live children). In addition, 5 had a subsequent ectopic gestation.

R. E. WOBUS.

Engelmann, F.: The Necessity and Results of Early Operation in Tubal Pregnancy. *Medizinische Klinik*, 1923, xix, 535.

During the past year at the Dortmund Frauenklinik, three times as many women as formerly were operated upon for extrauterine pregnancy. This the author attributes to the increase in pelvic infections, and the latter are due not so much to gonorrhea as to criminally induced or improperly handled abortions.

The afebrile patients stayed in the hospital on an average of 14 days while the febrile ones remained 30 days. Furthermore the latter were semi-invalids for a variable length of time afterwards. The author emphasizes that the fate of women with tubal pregnancy is dependent upon an early diagnosis and early operation. If one waits too long fever develops. Of late in the mildly febrile cases, the author has waited until the temperature subsided and then operated with success.

J. P. GREENHILL.

Hellendall, H.: Important Questions Regarding Tubal Pregnancy. *Medizinische Klinik*, 1923, xix, 311 and 341.

In the literature up to the present time there have been only fourteen reports of attempted abortion in cases of extrauterine pregnancy. Hellendall reports the fifteenth case. Of the fifteen cases, eleven were cured by laparotomy. The others died of peritonitis. Since this mortality is much higher than occurs when abortion is attempted in intrauterine pregnancy, the former cases must be very susceptible to serious infection. It is important in these cases to operate early.

The association of attempts at abortion and ectopic pregnancy is more frequent than is supposed. The occurrence of fever after operation for tubal pregnancy may in some cases be due to previous attempts to produce abortion.

In the second part of the article, Hellendall considers the matter of doing curettements in the presence of extrauterine pregnancy. In twelve cases, the curettements were done both for therapeutic and diagnostic purposes. In six cases, the physicians thought they were dealing with ordinary abortions and in two cases, carcinoma was suspected. In nine of the twelve cases, the curettement had no effect on the subsequent course of the tubal pregnancy. It is seen therefore that a careful curettement under the strictest aseptic precautions may be undertaken without harm for diagnostic purposes. However preparations for laparotomy must be made beforehand since the slightest pressure may at times cause severe hemorrhage.

In a number of cases, no decidua was found in the uterine scrapings. The absence of decidual cells in uterine scrapings does not therefore speak against an extrauterine pregnancy. The chief value of a diagnostic curettement lies in the discovery of placental elements in the uterus. This means an intrauterine pregnancy and will save the patient an unnecessary operation.

J. P. GREENHILL.

Dossena, G.: Conservatism in Surgical Treatment of Tubal Pregnancy. *Annali di Ostetricia e Ginecologia*, 1922, xlv, 407.

Usually the pregnant tube is removed, and not infrequently the non-pregnant tube as well. The author agrees that in cases of tubal rupture the tube should always be excised; on the other hand, if the pregnant tube is intact, as it often is in the condition of tubal abortion, it should not be removed, provided the corresponding ovary is in good condition, that the tubal lumen is patent, and that there are not marked peritubal changes such as old adhesions, kinks, etc.

He reports 11 such cases operated on in Mangiagalli's clinic since 1910. In all cases tubal abortion was found, the tube either already emptied of the ovum, or else gently dilated and pressed upon to complete a partial emptying. In no case was the tube removed. In the last case of the series it was impossible to say from which side the abortion had come. There were no deaths in this series.

Inasmuch as all of these cases improved immediately after operation it is evident that no bleeding follows a complete emptying of an intact tube. The question of recurrence in the same tube of an ectopic pregnancy should be answered more from the point of lesions of the serosa of the tube, e. g., kinks, adhesions, etc., than from the possibility of inflammations of the endosalpinx. The possibility of future malignant neoplastic changes in the affected tube is a purely theoretical one.

The treatment of tubal pregnancy should be, therefore, conservative rather than destructive whenever possible.

THOS. R. GOETHALS.

Whitehouse: Salpingotomy Versus Salpingectomy in the Treatment of Tubal Gestation. *Journal of Obstetrics and Gynecology of the British Empire*, 1922, xxix, p. 93.

The author concludes from dissection of fresh specimens of tubal mole that in each instance the ovum had been attached by a narrow pedicle to the floor of the proximal end of the tube. Remains of tubal mucosa were found extending several millimeters up along the pedicle in the majority of cases. The peristaltic action of the wall in tubal abortion tears through this pedicle. The deciding factor between intra- and extra-tubal rupture in any given case is a combination of tissue erosion and tension. Evidence of previous tubal infection was the exception in these cases. Rupture of a gestation situated on the supported floor of the tube usually extends into the lumen. Extra-tubal rupture is the rule in

pregnancy of the isthmic portion of the tube. Salpingectomy is the surgical treatment for these cases. In tubal mole or abortion, the author believes salpingotomy (in the absence of severe hemorrhage) has a place. H. W. SHUTTER.

Hawks: Immediate Versus Delayed Operation in Cases of Collapse Following Ruptured Ectopic Pregnancy. *Surgery, Gynecology and Obstetrics*, 1923, xxxvi, 232.

Hawks believes that even in case of collapse the patient has a decidedly better chance if operated on at once. In 134 cases operated during collapse there was a death rate of about 10 per cent, while of 71 cases not operated on, the mortality was 17 per cent. He believes that many a seemingly hopeless case may be made operable by giving a blood transfusion immediately before operation, and further blood transfusion or glucose solution, as indicated, immediately after the vessels are tied.

In an analysis of cases with fatal termination in which autopsy was performed, it is interesting to note that about as many died from rupture of the middle third of the tube as from rupture at or near the cornu, and that some died from rupture at the outer third.

R. E. WOBUS.

Brown, LeRoy: Menstrual Disturbance and Pain in Tubal Pregnancy. *Medical Record*, 1921, c, 839.

In a series of 55 patients 16 gave the classical history of having missed a period and later having irregular bleeding; 17 commenced the irregular uterine flow at the time of the expected normal period; and 16 continued with an irregular flow within a few days after the occurrence of the normal period. With reference to pain, the author found 22 cases in the series where the escape of free blood into the general peritoneal cavity caused intense recurrent pain in the abdomen, while escaped encapsulated blood in the pelvis in 20 cases caused pain of a different character varying in degree from instances of mild discomfort to that of much pelvic distress. In another class (7 cases) the only pain symptom was that of discomfort on the side involved in patients who were operated on before rupture or escape of blood had occurred. Another class (4 cases) had almost constant symptomatic uterine flow with discomfort of varying degree on one side and revealed at operation an encapsulated tubal hematocoele with a closed fimbriated extremity of the tube. On account of the immediate and changing pathological conditions present, there can be no constant symptoms existing in all cases. Uterine flowing is probably the most constant of all symptoms of tubal gestation. Even this is absent, however, in some of the most serious cases in which the erosive action of the villi has been sufficient so to weaken the tube wall as to permit of a rupture and profuse abdominal hemorrhage, the first symptom to call the patient's attention to her serious condition.

C. O. MALAND.

Laffont, Amédée: Delayed "High" Pain in Extranterine Pregnancy. A New Sign of Tubal Rupture. *La Presse Médicale*, 1924, No. 16, p. 167.

The author has noticed that in many cases of tubal rupture the patients complain of thoracic, interscapular, intercostal, or epigastric pain. This "high pain" is usually associated with an extended peritoneal inundation, in which the effused blood is not confined to the true pelvis; very infrequently is it noted in connection with encysted unilateral hematoceles. It is not a constant phenomenon, and nearly always follows the local pelvic pain of tubal rupture, the interval varying

from a few hours to two or three weeks; the average is two or three hours. It appears to be due to distension of the cul-de-sac of Douglas and to irritation of the peritoneum of the general cavity by the effused blood. A slight hemorrhage does not, as a rule, produce this symptom. Hence the "high pain" is an indication for immediate intervention. It is at times so severe and may develop so rapidly that thoracic or upper abdominal lesions are suspected, the pelvic symptoms being so slight as to be overlooked.

The mechanism of this phenomenon is in doubt, but it is evidently a reflex through the sympathetic system.

E. L. KING.

Novak: The Diagnosis of Tubal Pregnancy. *American Journal of Medical Sciences*, 1923, clxvi, 228.

An unusual classification is made in the non-tragic and tragic types, instead of the usual classification of unruptured and ruptured extrauterine pregnancy. Novak takes up the various symptoms and findings and lays special stress on the menstrual history, pelvic pain, the presence of a unilateral tender mass in the pelvis and the Cullen sign. He brings out that amenorrhea is not the usual thing in extrauterine pregnancy. Uterine bleeding is due to the death of the impregnated ovum which, because of its effect on the corpus luteum, had been inhibiting menstruation. He disclaims Polak's theory of ovular unrest. About 5 per cent of the cases are of the tragic type.

WM. KERWIN.

Trancu-Rainer: The Decidual Reaction in the Tubes in Single or Bilateral Tubal Pregnancy During the First Three Months. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1923, lxxxvi, 278.

The author describes four cases of tubal pregnancy in the fifth to twelfth week in which systematic study was made of both tubes for decidual reaction. In three of the cases, she found decidual reaction, in one case a slight, in the others extensive ones. In one case it was possible to make a direct comparison with the uterine decidua *in situ* and here it was possible to demonstrate a complete morphologic similarity between the two cell groups.

Of the six tubes of the three positive cases, four were pregnant. In all these the ovum was in the ampullary portion. Of the two non-pregnant tubes which were removed because of hematosalpinx, only one showed a decidual reaction, and this was in the mucosa, whereas the pregnant tubes showed also a decidual reaction on the serosa in three cases, and in the muscularis in one case. Evidences of inflammation were present in all cases, an important factor in the development of ectopic decidua in the estimation of Robert Meyer.

The author agrees with Unterberger that the capacity for development into decidua is not restricted to the stroma cells of the uterine mucosa but is a property of young actively growing connective tissue wherever located in the body.

MARGARET SCHULZE.

Fink, K: Intratubal Degeneration of Tubal Pregnancies. *Monatsschrift für Geburtshilfe und Gynäkologie*, 1922, lviii, 166.

Degeneration of young ova in the fallopian tube may occur and be so free from symptoms that the patient does not consult a physician. On the other hand, it may produce such atypical symptoms that an accurate diagnosis is impossible. Hence many cases of ovular degeneration are found accidentally.

In animals, complete absorption of ova in the tubes has been demonstrated and in the human, Polano as well as Fränkel have observed the disappearance

of ova in the uterus itself. Even after the bony structure has formed, absorption may take place.

Fink reports two cases in which ova in the fallopian tube were absorbed. One patient was operated upon three months and the other 3-4 weeks after the degeneration had occurred, as evidenced by the history. The author believes these ova were absorbed because the portions of the tube toward the ampulla were normal, because of the absence of blood in the abdominal cavity and the intactness of the tubal wall. The absence of symptoms, which accompany tubal rupture or abortion, also points to intratubal absorption. In both of these cases there were dry hematomas. Opposed to these dry absorptions is a form of degeneration which is associated with a hemorrhagic process. In this a pathological change takes place in the tube and also a concomitant change in the opposite non-gravid tube which cannot be differentiated macroscopically from a hematosalpinx. Two cases are reported which show this condition.

J. P. GREENHILL.

Oliver, James: A Study of the Death of the Full Term Extrauterine Fetus in Situ. New York Medical Journal, 1923, cxviii, 81.

Every extrauterine fetus attaining maturity does so by virtue of an accessory blood supply attained by the structure in which it is lodged, adhesions with the omentum and occasionally with the bowel. Tubal pregnancies enduring longest draw their blood supply from the portion of the tube resting in the broad ligament. Structurally the only difference between the placenta of the uterine and extrauterine pregnancy is that the former is so situated as to be shed early after labor.

The human oosperm never devours the living formed cells of the mother in order to make a special chamber for itself. This being true, hemorrhage in early tubal pregnancy is not due to an erosive action of the trophoblast. The mature extrauterine fetus dies when the limit of duration of the functioning activity of the placental cells is reached. Death occurs without a struggle from paralysis due to lack of mineral substances and oxygen. Similar deaths in uterine pregnancies are a well known cause of stillbirths. Death is in no way due to lack of vigor of the maternal circulation supplying the placenta. This is shown by the uncontrollable hemorrhage met in trying to remove such a placenta. The extrauterine fetus has a well formed, normally developed body up to the time of its death.

H. W. SHUTTER.

Hicks, H. T.: A Case of Full Term Ectopic Gestation with a Living Fetus. British Medical Journal, Jan. 28, 1922, page 141.

In this case an erroneous diagnosis was made earlier in the pregnancy. She was allowed to go to term. The baby was delivered by abdominal section. There was a very serious hemorrhage. The baby was normal, but died about thirty hours after delivery. The patient recovered after a stormy convalescence. The author draws the following conclusions: (1) The diagnosis between an intrauterine pregnancy complicated with a tumor and an ectopic gestation at term is often very difficult. (2) If diagnosed, the question of saving fetal life should be neglected. The fetus will most likely be deformed, and the hemorrhage from the living ectopic placenta is extremely alarming. (3) The patient should therefore be allowed to go through the spurious labor (when the fetus dies), and the operation should take place about three weeks later, when the dangers of hemorrhage will be much lessened.

F. L. ADAMS.

Benzel: Repeated Tubal Pregnancy in the Same Patient. *Deutsche Medizinische Wochenschrift*, 1923, xlix, 687.

The author reports a case of right tubal pregnancy with rupture occurring in a nulliparous patient one year after marriage. He removed the damaged portion of the tube and turned the stump under the peritoneum. One and one-half years later he operated on her for a left tubal pregnancy undergoing abortion. This tube he removed by a wedge-shaped excision from the uterus. He believes that this method should be used if the condition of the patient permits, because he has seen tubal pregnancy occur in the stump of a resected tube.

F. A. PEMBERTON.

Sippel: Simultaneous Tubal and Intrauterine Pregnancy. *Deutsche Medizinische Wochenschrift*, 1922, xlviii, 1202.

Sippel operated on a healthy woman for right sided tubal abortion of two months. At operation he discovered not only an ovarian cyst, the size of a chicken egg, on the same side, but found that the uterus also was pregnant. He removed tube and ovary and her recovery was uneventful. Eight months later the woman was delivered of a well developed child.

The extirpated ovary contained no corpus luteum, so that both ova must have originated in the left ovary. The left adnexa were normal at the time of operation. Fourteen months after the birth of her child, the woman was again operated on for ruptured tubal pregnancy of 7 weeks' duration on the opposite side. The seat of nidation was in the isthmus. As at the previous operation, there were no adhesions or other evidence of inflammation. The ovary was left *in situ*.

Since both tubes in this case were apparently normal and, it may be presumed, the left tube transmitted the ovum which developed within the uterus, he brings up the question whether the cause of extrauterine pregnancy may not exist in the ovum itself rather than in the tube.

R. E. WOBUS.

Stropeni: Contribution to the Study of Simultaneous Uterine and Tubal Pregnancies. *Annali di Ostetricia e Ginecologia*, 1921, xliii, 837.

Neugebauer reported 170 cases of simultaneous intra- and extrauterine pregnancies from the literature on this subject up to 1907; in 1913 he was able to bring the total up to 243. The author has been able to collect only five or six more cases from the literature since 1913, reporting in detail a case from the Torino clinic.

In 110 of the cases reported by Neugebauer the uterine pregnancy ended in abortion, spontaneously in most cases, in some cases after surgical treatment of the ectopic pregnancy. In 38 of Neugebauer's cases in which the fate of the ectopic fetus is reported, the latter reached term in 6, while in 35 cases both ectopic and uterine pregnancies reached term.

Although Fenger states that operation on the tube in such cases is regularly followed in a few days by uterine abortion, Neugebauer's series show 73 in which the uterine pregnancy proceeded to term with a living child, despite previous operation for the ectopic in 35 of them.

The case reported by the author is of a 37 year old woman in her second pregnancy, with a history of a pregnancy interrupted in the first month 8 years before, and with gonorrhea two years ago. She was operated on for intestinal obstruction 28 days after a tubal rupture in the second month, and the tube

removed. A month later a 5 month pregnancy was diagnosed, and 4 months later a full term hydrocephalic child was born, after a long labor, by craniotomy.

The author believes, in the light of this case, taken in conjunction with Neugebauer's series, that when it is necessary to intervene in a case of extrauterine pregnancy it is not necessary to consider the possibly coexisting uterine pregnancy, as the latter has a great probability of going on normally to term.

THOMAS R. GOETHALS.

Thorek: Unilateral Twin Tubal Pregnancy. New York Medical Journal, 1921, cxiv, 403.

The author briefly reviews the literature and gives illustrations and a report of his own case. The patient was a white woman of 29, who had had two children by normal labors. Her history and examination pointed to a ruptured ectopic gestation at four to five months. At operation, the left tube was found ruptured, with twin fetuses $6\frac{1}{4}$ inches in length, attached to a common placenta free in the abdominal cavity with much old blood.

MARGARET SCHULZE.

Daniel: Interstitial Pregnancy. Surgery, Gynecology and Obstetrics, 1922, xxxiv, 15.

Daniel reports two cases of this condition and, in this connection takes up the subject of differential diagnosis. About the only symptom which is present with any degree of regularity, is delayed menstruation. In addition to this, there is, at times an expulsion of decidua, and always a varying asymmetry of the uterus. The adnexa, as well as the insertion of the round ligaments also show a variation, depending upon the asymmetry of the uterus itself. However, these symptoms are not constant or, if present, cannot always be detected, so that, as in his two cases, the diagnosis is usually made only after removal of the specimen.

R. E. WOBUS.

Woolf: Bilateral Interstitial Ruptured Ectopic Gestation Sacs. The Lancet, 1922, ccii, 11.

The author reports an unusual case of bilateral interstitial ruptured ectopic gestation sacs occurring in a married woman. A subtotal hysterectomy was done.

NORMAN F. MILLER.

Fuchs, H.: Ovarian Pregnancy in the Absence of the Corresponding Tube (External Migration of Spermatozoa). Monatschrift für Geburtshilfe und Gynäkologie, 1923, lxiii, 61.

A patient was operated upon for ectopic pregnancy in February, 1922. The left tube containing the pregnancy was removed. Examination showed the corpus luteum of pregnancy to be in the right ovary and hence this was a case of external migration of the ovum.

A short time after this operation the patient again became pregnant and because of vaginal bleeding was examined thoroughly. In the midline was found what appeared to be a four months' pregnant uterus. Immediately after the examination the patient collapsed. A second examination revealed marked changes in the tumor previously felt. A laparotomy was performed and about 1 liter of blood was found in the abdominal cavity. The tumor from which the blood was flowing was found to be lying on the uterus, which was of normal size but pushed to the right side. The tumor was removed. At the site of the former salpingectomy there was a smooth peritoneal surface.

The tumor on microscopic examination proved to be an ovarian pregnancy in which the nidation had been intrafollicular. It was situated rather deeply in the ovarian tissue. In this case there had occurred an external migration of the spermatozoon.

J. P. GREENHILL.

Hunter: A Case of Early Ovarian Pregnancy. The Medical Journal of Australia, 1921, ii, 233.

The case reported is one of very early ovarian pregnancy. The author believes that the specimen is approximately three weeks of age.

All requirements which must be fulfilled before a specimen may properly be designated an ovarian pregnancy were satisfied in this case. Several excellent photographs accompany the careful description of the specimen.

NORMAN F. MILLER.

Chalfant: Ovarian Pregnancy with Report of a Case. The Pennsylvania Medical Journal, 1921, xxiv, 548.

Spiegelberg in 1878 suggested certain criteria essential to the diagnosis of ovarian pregnancy: (1) the tube on the affected side must be intact, (2) the fetal sac must occupy the position of the ovary, (3) it must be connected to the uterus by the uteroovarian ligament and (4) definite ovarian tissue should be found in the sac wall. The case reported by Chalfant apparently conforms to all the Spiegelberg criteria.

The article includes several excellent microphotographs.

NORMAN F. MILLER.

McMillan and Dunn: Report of a Case of Abdominal Pregnancy Following Hysterectomy. Surgery, Gynecology and Obstetrics, 1921, xxxiii, 199.

Hysterectomy was performed on a young girl for double pyosalpinx. Since the right ovary and a portion of the right tube were found to be practically normal, they were sewed to the stump of the cervix. Eighteen months later the patient was brought back on account of a tumor in the abdomen. The patient looked and felt well, only complaining of "cramping and kicking in the abdomen." She was very indignant on being told she was pregnant, as she had been assured on leaving the hospital that she was sterile.

The patient had cramplike pains which increased in severity. Abdominal section revealed a dead baby, weighing 8½ pounds, enclosed in an intact amniotic sac. This was partly covered by clotted blood. The placenta was situated in the region of the spleen and was removed.

A year and a half later she had an attack of abdominal pain and signs of internal hemorrhage. She was again operated. The abdomen contained free blood and an amniotic sac, partly covered by the remnants of the tube, within it a 4-pound fetus. As the patient had been nearly exsanguinated, she succumbed shortly afterward.

R. E. WOBUS.

Jacquin, P.: Primary Abdominal Pregnancy. Gynécologie et Obstétrique, 1922, v, 492.

Exact diagnosis of this condition requires careful macroscopic and microscopic examination to determine the actual relationship of the implantation to the genital organs, especially the tubes and ovaries. In many cases it is impossible to have all the conditions necessary for certain diagnosis. He gives a critical

analysis of reports of cases to which he adds some personal observations. He concludes that the primary peritoneal implantation of the ovum actually occurs. Implantation in the region of the cul-de-sac is frequent and easy to understand. The necessary etiologic factors are (1) the ovum should be fertilized within the peritoneal cavity; (2) that it does not migrate into the tube; (3) that it has an opportunity to become implanted on the peritoneal surface. The treatment is complicated by hemorrhage which results from operative procedures. It has not been proved that the peritoneal implantation can continue until term. Theoretically, in operative procedures on advanced peritoneal pregnancy, marsupialization of the placenta is preferable to its removal.

F. L. ADAIR.

des Lignaris: A Case of Schistosomiasis of the Female Pelvic Genitalia with Subsequent Tubal Pregnancy and Abortion. *The Medical Journal of South Africa*, 1921, xvii, 46.

The writer reports the case of an Indian woman who presented the rare condition of ovarian bilharziasis. The case is discussed fully and is interesting both because of its rarity and in that it shows the reaction of ovarian tissue towards Schistosomiasis.

NORMAN F. MILLER.

Streeter, G. L.: Subcutaneous Implantation of the Human Ovum. *Journal of the American Medical Association*, 1923, lxxx, 989.

Streeter reports a case of implantation of the ovum in the superficial fascia of the abdomen. The ovum had attained the size of a hen's egg. A well formed embryo with the sac intact was found. Blood vessels leading to the area of implantation were enlarged. Patient had been operated on two years previously, and a round ligament shortening done. The fallopian tube was mistaken for the round ligament on the one side and was drawn up and sutured to the fascia. The fertilized ovum, delayed at the point of kinking, eroded its way through the tube and continued its development in the fascia. The case is probably unique so far as the site of implantation is concerned.

W. KERWIN.

Forsyth: Erosion of the Rectum by an Ectopic Placenta. *The Lancet*, 1923, cciv, 795.

The patient, a married woman aged 34, had an ectopic gestation which evidently occurred in the ampullary end of the tube, and the gestation sac had been extruded by a tubal abortion rather than by tubal rupture. The ectopic placenta had eroded through into the rectum, with the result that there was a clean-cut lesion extending entirely through the rectal wall.

The patient was operated and left the hospital in excellent health.

NORMAN F. MILLER.

Kahn: Infected Extrauterine Pregnancy Rupturing into Bladder after Thirteen Years. *Journal American Medical Association*, 1922, lxxviii, 889.

The case here reported is that of a woman aged 57, who had been widowed 14 years. Three years prior to her husband's death, she was curetted for irregular bleeding. After her curettage she suffered with severe right sided pain which did not subside with the menopause, but became steadily worse. During the last year and a half of her life she had dysuria, with occasional attacks of severe purulent cystitis. During this time she occasionally passed fetal bones through the urethra, and finally died from sepsis.

R. E. WORUS.

Novak: Bluish Discoloration of the Umbilicus in the Diagnosis of Ruptured Extrauterine Pregnancy. *Journal American Medical Association*, 1922, lxxviii, 643.

Novak calls attention to the discoloration of the umbilicus in cases of ruptured ectopic pregnancy which was first described by Cullen in 1919. He thinks it is due to the absorption of free blood by the lymphatics of the umbilicus. It varies from bluish-black in recent cases to greenish-yellow in later stages.

R. E. WOBUS.

Chifoliau: Discoloration of the Umbilicus in Intraperitoneal Hemorrhage of Pelvic Origin. *Le Progrès Médical*, 1921, xxxvi, 534.

Chifoliau reports two cases where the skin in the region of the umbilicus was discolored by an infiltration of blood pigment. One was a case of ruptured ectopic pregnancy with hematocele formation in the posterior culdesac, and the second a case of right ovarian cyst with twisted pedicle. In both of these cases free blood was found in the peritoneal cavity upon opening the abdomen. The author therefore feels justified in pointing out that where umbilical ecchymosis is associated with some pelvic pathology a diagnosis of free blood in the peritoneal cavity may be made.

THEODORE W. ADAMS.

Moore: Intraabdominal Hemorrhage from Ruptured Corpus Luteum. *Annals of Surgery*, 1922, lxxv, 492.

Moore reports two cases of intraabdominal hemorrhage from ruptured corpus luteum upon which he operated. In addition he reviews those cases which he could find in the literature at his disposal, 14 cases in all. The claim that these ruptures occur at any particular time of the menstrual cycle is not borne out by this series as they occurred at various periods. Rupture was usually preceded by some form of violence such as vomiting, coughing, sneezing, straining at stool or a minor injury. One case ended fatally and the diagnosis was made only postmortem. In none of the cases cited was the diagnosis made before operation.

R. E. WOBUS.

Schumann: Observations on Hemorrhage of Ovarian and Tubal Origin. *Journal American Medical Association*, 1921, lxxvii, 692.

Schumann calls attention to the fact that hemorrhage into the abdominal cavity from the female genitalia need not necessarily be from an ectopic pregnancy. This is of importance especially in cases of unmarried women who might be wrongfully accused of being pregnant if this fact be not borne in mind.

These hemorrhages are usually from a ruptured ovarian follicle or cyst but may occur from the rupture of the ovary itself. Rupture of a tube has been reported due to violent exercise. The lack of preceding uterine bleeding is a factor in differential diagnosis.

Three case reports are included. A young girl who had symptoms of pelvic hemorrhage recovered without operation. In a woman of 37 years, the hemorrhage was from an ovary showing degeneration of the vessel walls. The third case was that of a simple hematosalpinx in an unmarried woman of 30 with otherwise normal genitalia.

R. E. WOBUS.

Hornung, R.: The Ovary as a Source of Intraperitoneal Hemorrhage. *Münchener medizinische Wochenschrift*, 1923, lxx, 592.

Like all extremely vascular organs the ovaries are predisposed to hemorrhage, the types being three: follicular, corpus luteum and interstitial. The ovarian

hemorrhage usually comes at the next menstrual period after the rupture of the corpus luteum. Some ovaries may have an idiopathic tendency to bleed but besides such a tendency there are other concomitant conditions such as: any local or general cause leading to active or passive congestion; delay in the menstrual period; any sudden interference with circulation such as twisting of a pedicle; excessive sexual stimulation; possibly trauma and operations on the internal genital organs. Abnormal circulatory conditions with a definite disturbance in the blood forming organs, such as a leukemic condition, certainly plays a part. In acute or chronic abdominal conditions the differential diagnosis is always difficult but whenever there is a question of bleeding the safe procedure is to operate.

A. C. WILLIAMSON.

Melchior: Abdominal Hemorrhage Following Rupture of a Small Ovarian Cyst. *Paris Médical*, 1924, xiv, 39.

Calling attention to the necessity of bearing in mind the possibility of hemorrhage in any acute abdominal condition, Melchior cites a case of hemoperitoneum which was diagnosed as peritonitis due to rupture of the appendix. The right ovary was found enlarged to the size of a mandarine, it was very hard and contained numerous cysts the size of walnuts. One of these cysts had ruptured when the patient alighted from a railroad car. On section the tumor was found to be a fibrocystoma. The appendix was normal.

R. E. WOBUS.

Weber, Eric: The Peritoneal Inundation by Rupture of Perifibromatous Varices. *Gynécologie et Obstétrique*, 1921, iv, 560.

The author gives a short résumé of the literature on this question.

F. L. ADAM.

Ransahoff and Dreyfoos: Dangerous Intraperitoneal Hemorrhage from Uterine Fibroid. *Surgery, Gynecology and Obstetrics*, 1921, xxxiii, 296.

Attention is called by these authors to the rare condition where dangerous or even fatal hemorrhage results from rupture of varicose veins situated beneath the peritoneum of subserous fibroids. They report a case occurring in an unmarried woman of 35, whose life was saved by prompt hysterectomy.

R. E. WOBUS.

Töpler: Re-Infusion of Blood in Ruptured Ectopic Pregnancy. *Deutsche Medizinische Wochenschrift*, 1922, xlviii, 92.

In 1914, Thies first advocated the re-infusion of the blood found in the abdominal cavity at operation for ruptured extrauterine pregnancy. After the tube is clamped, the free blood is dipped out of the peritoneal cavity and strained through 8 layers of gauze to remove clots, etc. It is then diluted with an equal amount of normal salt solution and introduced through a cannula which has meanwhile been inserted into the median basilic vein. The blood is not defibrinated nor is citrate added.

Töpler has used this procedure in 24 cases which were in a serious condition from acute anemia, without a single death. In none of the cases did he experience any difficulty or untoward symptoms. The amount infused varied between 150 c.c. and 900 c.c. The beneficial results were usually immediately apparent.

While Töpler still uses salt solution in the milder cases, he feels that this method will save the life of many a patient who would otherwise die from shock.

R. E. WOBUS.

Runge: An Aid in the Treatment of Acute Anemia in Labor. *Deutsche Medizinische Wochenschrift*, 1922, xlviii, 1924, 156.

In view of the technical difficulty of blood transfusion as well as the delay incident to procuring a proper donor in emergency, Runge has for some time administered the blood lost by the patient in the form of an enema. He was surprised to note the prompt action of this procedure upon the patient's condition. To ascertain the relative amount of blood actually absorbed in this way, he examined the subsequent stools of these patients and in most cases was unable to demonstrate blood either macroscopically, microscopically or by chemical tests. He now saves the blood lost during labor as a matter of routine, and in case of excessive blood loss, mixes 600 c.c. of the blood with 400 c.c. of a 0.9 per cent solution of sodium chloride. To this mixture he adds a solution containing from 1 to 4 per cent of sodium citrate. The mixture is then introduced as an enema. Patients usually retain at least from 600 to 700 c.c. In severe cases he administers from 600 to 1,000 c.c. in addition by the drop method.

R. E. WOBUS.

Zimmermann: Indications for Retransfusion of Blood Poured into the Abdominal Cavity. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1921, lxxxiv, 335.

Clinical experience and also a considerable number of animal experiments made by the author indicate that the peritoneal cavity may under normal circumstances absorb even large quantities of blood poured out into it. The large proportion of erythrocytes which thus arrive in the peritoneal cavity are returned to the blood stream so quickly that their functional capacity is unimpaired. So rapid is this absorption by the uninjured peritoneum that it is impossible to produce hematocele experimentally by the single injection of a large amount of blood. When an extrauterine pregnancy ruptures the blood flows comparatively slowly and often in several stages into the peritoneal cavity and there is thus given opportunity for clotting and for defibrination. Since none of the experimental animals showed peritoneal irritation, the author believes the clots must be the cause of the fibrinous exudates and the adhesions seen clinically. These adhesions interrupt the capillary stream normally directed toward the diaphragm, and render impossible an effective resorption. When the case comes to operation and these adhesions are separated and the clots removed, conditions favorable to absorption are restored, and the remaining fluid blood is rapidly returned to function in the patient's blood-stream. The author's practice, therefore, in cases of non-infected accumulations of blood in the peritoneal cavity in cases of ectopic pregnancy, is as follows: The hemorrhage is definitely controlled; easily accessible coagula are rapidly removed and the fluid blood is allowed to remain. This is defibrinated and therefore is no longer coagulable. A rapid resorption of the fluid blood takes place. This is evidenced clinically by the very rapid recovery of these patients.

Since the results of peritoneal absorption are so brilliant, and intravenous reinfusion is not without considerable danger, the author believes the indications for the latter should be very distinctly limited. When during the operation the patient's condition becomes worse instead of improving, when her pulse does not return, and a lethal outcome seems imminent, then reinfusion should be tried as a life saving measure. Even in these cases certain conditions must be fulfilled: The blood must be fresh, not toxic and not infected. Absence of infection may be demonstrated by examination of a smear stained for bacteria. That it must be fresh means that the red blood cells must still be func-

tionally capable. This may be demonstrated by absence of signs of degeneration of the red cells in a fresh unstained smear. The blood should, however, have been poured out sufficiently long to have become defibrinated, since absolutely fresh blood entails the danger of clotting and embolism. Toxicity may be due to degeneration of the erythrocytes or to an increase in the ferment content of the blood. The latter cannot be determined by any easily performed clinical test, yet if we limit reinfusion to the cases which would surely die without it, we may ignore the risk from this factor.

MARGARET SCHULZE.

Eick: Bleeding from Corpus Luteum Simulating an Attack of Appendicitis. *Zentralblatt für Chirurgie*, 1924, li, 374.

A delicate young lady, fairly well nourished, is suddenly seized with acute pain in the right lower quadrant a few days previous to an expected menstrual period. The pain persisted to the following day and there was some nausea. Temperature slightly above normal; bowel movement normal; no urinary disturbance. The pulse was 96 and regular, the abdomen soft and not distended. In the right lower quadrant, however, there was a tendency to rigidity and there was distinct tenderness at McBurney's point.

Under the diagnosis of appendicitis, the abdomen was opened. The appendix was found to be normal. After the appendix was removed, fresh blood was seen to well up from the pelvis. The uterus and adnexa were found to be normal, except for a bleeding point from a corpus luteum in the right ovary. The ovary was removed and showed a corpus luteum of 10 or 12 days' duration with a rupture on its surface. The ovarian vessels were engorged and a ruptured vessel was found at the point of rupture which, however, was filled by a thrombus, indicating that the bleeding probably originated in the depths of the corpus luteum which was partly filled with blood clots. Menstruation appeared two days after operation.

R. E. WOBUS.

Books Received

THE BIOLOGY OF THE INTERNAL SECRETIONS. By Francis X. Dercum, Professor of Nervous and Mental Diseases in the Jefferson Medical College, etc. Philadelphia and London, W. B. Saunders Company, 1924.

DIE THERAPIE DES WOCHENBETTFLIEBERS. Von Privatdozent Dr. Robert Koehler, Wien. Zweite vermehrte und verbesserte Auflage. Mit 27 Abbildungen im Texte. Leipzig und Wien, Franz Deuticke, 1924.

DIE ROENTGENBEHANDLUNG DES MAMMAKARZINOMS. Von Dr. Hermann Wintz, Professor, Direktor der Universitäts-Frauenklinik in Erlangen. Mit 4 Abbildungen und 82 Lichtdrucktafeln. Verlag von Georg Thieme, Leipzig, 1924.

DIE SCHWANGERSCHAFT in ihren Beziehungen zu den andern Gebieten der Medizin und ihre biologischen Probleme. Von Dr. Paul Huessy, Privatdozent an der Universität Basel, etc. Mit 8 farbigen Textabbildungen und 18 Kurven. Verlag von Ferdinand Enke in Stuttgart, 1923.

BIOLOGIE UND PATHOLOGIE DES WEIBES. Lieferung 7. Herausgegeben von Josef Halban und Ludwig Seitz. Mit 42 Abbildungen im Texte und 2 farbigen Tafeln. Urban und Schwarzenberg, Berlin und Wien, 1924.

DIE GYNAEKOLOGISCHE OPERATIONSTECHNIK der Schule Ernst Wertheim's. Herausgegeben von Professor Dr. Wilhelm Weibel, etc. Mit 300 Abbildungen. Berlin, Verlag von Julius Springer, 1923.

DIE GYNAEKOLOGIE DES PRAKTISCHEN ARZTES. Von Dr. Ernst Runge, Mit 60 Abbildungen im Texte. Verlag von Urban und Schwarzenberg, Berlin und Wien, 1924.

DIE KAPILLAREN DER MENSCHLICHEN KOERPEROBERFLAECHE in Gesundheit und Krankheit. Dargestellt von Professor Otfried Mueller, Vorstand der medizinischen Klinik in Tuebingen. Mit 187 farbigen Abbildungen auf 20 Tafeln und 28 Textabbildungen. Verlag von Ferdinand Enke in Stuttgart, 1923.

PRACTICAL MEDICINE SERIES. Volume V. GYNECOLOGY, edited by Thomas J. Watkins, professor of Gynecology, Northwestern University Medical School, Chicago; OBSTETRICS, edited by Joseph B. De Lee, Professor of Obstetrics, Northwestern University Medical School, Chicago. The Year Book Publishers, Chicago, Series 1923.

MANUAL OF GYNECOLOGY AND PELVIC SURGERY. By Roland E. Skeel, formerly Associate Clinical Professor of Gynecology, Medical School of Western Reserve University, Cleveland, etc. Second edition with 281 illustrations. Philadelphia, P. Blakiston's Son & Co., 1924.

MATERNITY NURSING IN A NUTSHELL. By Elizabeth H. Wickham, Graduate of the Boston City Hospital, etc. With 28 illustrations. Philadelphia, F. A. Davis Company, 1924.

LEHRBUCH DER PHYSIOLOGISCHEN CHEMIE. Herausgegeben von Olof Hammarsten, ehem. Professor der medizinischen und physiologischen Chemie an der Universitaet Upsala. Zehnte Auflage, mit einer Spektraltafel. Muenchen, Verlag von J. F. Bergmann, 1923.

HANDBUCH DER KINDERHEILKUNDE. Herausgegeben von Professor Dr. M. von Pfaundler und Professor Dr. A. Schlossmann. III. Band, der dritten Auflage, mit 15 Tafeln and 195 Textfiguren. Leipzig, Verlag von F. C. W. Vogel, 1924.

DIE EKLAMPSIE. Herausgegeben von Professor Hans Hinselmann. Mit 13 Tafeln und 52 Abbildungen im Text. Verlag von Friedrich Cohen in Bonn., 1924.

MODERN UROLOGY, in original contributions by American authors. Edited by Hugh Cabot, Dean and Professor of Surgery in the Medical School of the University of Michigan, Ann Arbor, Mich. Second edition, thoroughly revised in two volumes, first volume illustrated with 398 engravings and 11 plates, second volume, with 288 engravings and 8 plates. Philadelphia and New York, Lea & Febiger, 1924.

A WOMAN'S QUEST. The life of Marie E. Zakrzewska, M.D. Edited by Agnes C. Victor, M.D. D. Appleton and Co., New York, 1924.

LECTURES ON ENDOCRINOLOGY. By Walter Timme, M.D. Attending neurologist, Neurological Institute, New York, etc., etc. Paul B. Hoeber, New York, 1924.

BIOLOGIE UND PATHOLOGIE DES WEIBES. Herausgegeben von Professor Josef Halban und Professor Ludwig Seitz. Lieferung 8. Urban und Schwarzenberg, Berlin, 1924.

ANESTHESIA. By James Tayloe Gwathmey, anesthetist to New York Cancer, Columbia, and Peoples Hospitals, etc., etc. With collaboration of special subjects. Illustrated. Second revised edition. The Macmillan Co., New York, 1924.

DIE KONSTITUTION DER FRAU. Von Dr. Bernhard Asehner, Privatdozent an der Universitaet Wien. Erster Band. Allgemeine Konstitutionslehre. Verlag von J. F. Bergmann, Muenchen, 1924.

FERTILITY AND STERILITY IN HUMAN MARRIAGES. By Edward Reynolds, M.D., and Donald Macomber, M.D., Boston. With a section on the Determining Causes of Male Sterility by Edward L. Young, Jr., M.D., Boston. Illustrated. W. B. Saunders Company, Philadelphia, 1924.

INTERNATIONAL CLINICS. A Quarterly of illustrated clinical lectures and especially prepared original articles. Edited by Henry W. Cattell, A.M., M.D., Philadelphia. Volume II. Thirty-fourth Series, 1924. J. B. Lippincott Co., Philadelphia, 1924.

ROENTGENTHERAPIE. Neun Vortraege von G. Holzknecht, Professor an der Wiener Universitaet, etc. etc. Urban und Schwarzenberg, Berlin, 1924.

The American Journal of Obstetrics and Gynecology

VOL. VIII

ST. LOUIS, SEPTEMBER, 1924

No. 3

Original Communications

THE RELATION OF VENEREAL DISEASES TO CHILDBIRTH*

BY EDWARD A. SCHUMANN, M.D., PHILADELPHIA, PA.

CONCEPTION taking place in a woman who is the victim of venereal disease, carries with it potentialities of peril both to the mother and the child, the extent of which may only be measured by the virulence of the infecting organisms. Gonorrhea, syphilis, chaneroid and that bizarre lesion, granuloma inguinale, are all stimulated as to the severity of their manifestations by pregnancy, and in the presence of two of them at least, the child is in grave danger even to its life.

This communication proposes to deal with the less settled phases of the subject and to invite expression of opinion as to the many unsolved problems and relationships which meet the clinician in his contact with venereal diseases complicating pregnancy and labor.

Gonorrhea and pregnancy may be associated in one of three ways:—1st, the gonorrhea may have antedated the pregnancy, the lesion remaining active being an endocervicitis, a mild nonobstructive salpingitis or both; second, the gonorrhea may have been contracted coincidentally with impregnation, and third the disease may be acquired while the woman is in the pregnant state. Naturally by far the greater number of patients fall into the first group, the second and third being relatively insignificant as to numbers, but of great importance as regards the gravity of the coexistent condition.

The hyperemia and succulence of the pelvic organs in pregnancy tend to intensify the reaction of the tissues to gonorrheal infection as well as to stimulate the multiplication of the bacteria and this aggravation of the disease proceeds in almost direct ratio to the acuteness of the infection.

*Read at a joint meeting of the Philadelphia Obstetrical Society and the New York Obstetrical Society, held in New York, April 8, 1924.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

Extension of a gonorrheal urethritis and cervicitis to the endometrium and tubes during pregnancy is a common event. Even latent gonorrhea may become active at this time and give rise to extensive destructive inflammatory change in the uterus and adnexa. That the tubal infection has occurred subsequent to conception may be proved by the fact that so many of these tubes are occluded, the fimbriae being glued together by inflammatory exudate.

This is the mechanism underlying many of the cases of one child sterility, the causation of which is sometimes so difficult to ascertain.

The frequency of gonorrhea as a complication of pregnancy is astonishing if one may believe the published statistics. From the 25 to 50 per cent incidence in the series of Zwow, Gurd and Sanger even to the low estimate of between 5 and 10 per cent made by Harrar, Taussig, and others, the occurrence of this complication is distressingly high.

I believe that all these series give an erroneous impression as to a cross section of the population, since they are mostly based on dispensary patients, with a high proportion of Negroes among them.

In the author's private practice in 150 cases seen since the routine cervical smear has been a part of his prenatal study, but one positive slide has resulted, and that a doubtful one which was not confirmed upon subsequent examination. Such figures which must be common experience with all of us, lead one to believe that the generally accredited coincidence neisserian infection in pregnant women is grossly overestimated.

As a cause of unfecond marriage, however, the gonococcus stands easily in first place. If to the frequent sterility in the male there be added the cases in which dyspareunia and condylomata prohibit intercourse as well as the obstructive lesions of the tubes, the perioophoritis and endocervicitis which are so commonly the termination of the infection, the effect upon the limitation of conception is unquestioned.

Even should conception take place in a gonorrheic woman, the possibility, indeed probability, of abortion as a result of decidual endometritis or the lighting up of a pelvic peritonitis is very great.

There is a commonly accepted belief that the gonococcus is an active causative agent in the production of puerperal sepsis, but this opinion is, I think, subject to grave doubt. Sanger's statement that 15 per cent of women suffering from gonorrhea at the time of delivery develop puerperal infection (Sanger, quoted by Norris: *Gonorrhea in Women*, Saunders, 1913, p. 358) may be true but if one considers that the incidence of the gonococcus in the pelvic organs of the pregnant woman is at best uncommon, its importance as a general cause of infection during the puerperium must be slight. Furthermore, it has been shown by Curtis (Curtis, A. H.: *Bacteriology and Pathology of Fallopian Tubes Removed at Operation*. Trans. Amer. Gyn. Soc., 1921, 257) that the tube is not a focus for chronic gonorrheal infection, although it is true that when a salpingitis of gonorrheal origin has damaged the

structure of the tube, the resistance is lessened and the invasion of bacteria, as the streptococcus, staphylococcus and coli communis in numbers which would have no effect upon normal tissues, may readily produce destructive results.

The arraignment of neisserian infection as a complication of the child-bearing process cannot be dismissed without mention of its significance in the causation of ectopic gestation.

It is generally conceded that this accident most commonly follows a healing salpingitis, or one in which there is no present inflammation but wherein the lumen of the tube is narrowed by adhesion kinks or masses of exudate. Inasmuch as these are the characteristic lesions of gonorrhea, it follows that this disease is an exceedingly widespread and pernicious agent in producing tubal pregnancy.

The above generalizations lead naturally to definite conclusions as to the management of gonorrhea complicating pregnancy about as follows:

If vulvar or cervical infection be manifested during gestation, every effort should be made to localize the disease and to prevent its ascent to the decidua and the tubes. All traumatization of tissues is dangerous, and vigorous manipulation should be avoided to prevent possible abortion as well as to limit the area of infection.

A satisfactory plan is to gently coat the entire vagina and cervix with a 20 per cent argyrol solution at weekly intervals and to instruct the patient to fill the vagina with a 10 per cent solution of the same drug daily, using from two to four ounces, instilled by means of a soft rubber ear syringe and held in place for twenty minutes by closing the labia with the fingers.

Old chronic endocervicitis requires treatment chiefly upon indication of a profuse, irritating leucorrhea which often gives rise to intense discomfort by its excoriating action upon the skin of the pudenda.

The free use of a powder composed of equal parts sodium bicarbonate and Fuller's earth, installed into the vagina and retained for forty-eight hours by means of a cotton tampon, will usually so diminish the secretion that the symptoms are promptly allayed.

Upon the onset of labor, the question of ophthalmia arises and is met by frequently flushing the birth canal with a 10 per cent argyrol solution during the progress of labor. Enough argyrol is used to thoroughly bathe the vaginal and cervical mucosa and the solution should not be sponged away or withdrawn but permitted to lie in the vagina until expelled by the contractions incident to the labor. The management of the infant's eyes needs no discussion.

Gentleness of manipulation and a minimizing of the tissue trauma are matters of the utmost importance in the conduct of labor in a woman suffering from gonorrhea.

Early resort to forceps or version, Credé expression of the placenta, vigorous massage of the uterus; all these practices tend toward the re-

lighting of an old, possibly mild salpingitis with its potentialities for severe infection of the pelvic structures. Indeed, the entire management of pregnancy complicated by gonorrhea may be well summed up in the motto which surmounts the entrance to one of our prominent surgical clinics, "noli loqui, noli tangere."

In this skeptical age, when we feel that the art of medicine is an old wife's tale and that the recognition and management of disease has been carried beyond all empiricism and become reduced to a mathematical formula, it is good to occasionally receive a distinct blow to our self-esteem as exemplified by the instance of what has been alluded to as that bizarre lesion, granuloma inguinale.

That a disease, well known, regularly diagnosed and successfully treated in South America and in Asia for many years, should have repeatedly presented itself, indeed, have been practically endemic in most of our larger hospitals for more than a half century, without recognition, masquerading under a diversity of erroneous diagnoses and as diversely treated albeit always without success; such a state of affairs serves well to make us pause and consider—and perhaps to return for a moment to "humility and modest stillness."

The records of the Philadelphia Hospital show that granuloma inguinale has been regularly present in the wards for years, as has been pointed out by Randall in his very complete paper on this subject (Randall, Small & Belk. *Granuloma Inguinale, Surg. Gyn. & Obst.*, xxxiv, 1922, 717).

The nature of the lesion was not understood, however, until the paper of Symmers and Frost (*Jour. Am. Med. Assn.*, 1920, lxxiv, 1304) called attention to the fact that this supposedly tropical disease might be endemic in this latitude. A deal of time might be consumed by a discussion of so unusual and refractory a lesion, but its effect upon child-bearing is so comparatively unimportant, that a brief resumé of the relationship will suffice.

From the very nature of the disorder it follows that conception among women so afflicted is most exceptional. The huge, proliferating masses, simulating immense condylomata, with their areas of cicatrization and of raw granulating surface, the odor foul from secondary filth infection and the discharge profuse especially in the older cases, together with the chronicity of the disease, render pregnancy an obviously uncommon sequela. However, the two conditions do exist coincidentally and when they do, two considerations must be born in mind in the management of the patient.

Owing to the location and nature of the lesion, vaginal delivery is almost always impracticable and cesarean section is the advisable measure to which to resort. Treatment with tartar emetic, the accepted method, or any other form of therapeutics, gives no relief during pregnancy, the affected areas becoming steadily greater in extent and the activity

of the process increasing. Rapid and severe anemia usually accompanies the imposition of pregnancy upon granuloma and the patient is apt to prove a poor operative risk on this account unless active hematonic treatment is instituted. For these reasons also, delivery, by section, should be accomplished so soon after the viability of the child is established as will give it a proper chance for life.

One illustrative case is presented here.

A. L., negress, twenty-four, was admitted to the Philadelphia General Hospital, April 3, 1923, suffering from an advanced granuloma inguinale (Fig. 1). She was married and six months pregnant and despite very active treatment the lesion progressed with considerable rapidity. July 10, 1923, my colleague, Dr. McGlinn (to whom I am indebted for permission to record this portion of the history) per-

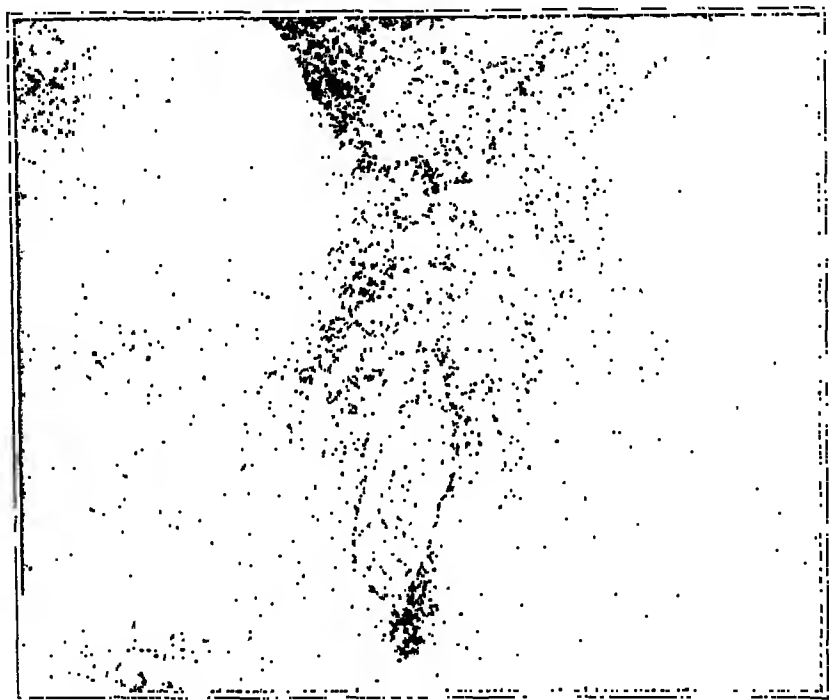


Fig. 1.—Granuloma inguinale. Photo taken after cesarean section, August 6, 1923.

formed a conservative cesarean section, with the uneventful recovery of mother and child. During the puerperium active treatment with tartar emetic was resumed with the prompt regression of the lesion and in August the patient and child were discharged, in good condition.

The woman menstruated again in September and then became pregnant again, the granuloma appearing shortly after conception and spreading with great rapidity.

She is now in the writer's service at the hospital (Fig. 2) receiving tartar emetic intravenously without benefit and awaiting a second section upon the complete viability of the child. Unfortunately, recurrences of this condition are common and are especially prone to occur when pregnancy supervenes.

The mere mention of the words syphilis and childbirth in combination, brings to the mind the many fascinating problems of biology, disease transmission and antenatal therapeutics which arise when these two conditions occur simultaneously.

Proteus, in form indefinite and intangible, chameleon in colors changing without cessation, and increasingly deceptive, a last plague from Pandora's box, a prodigy fallen from the stars, to quote the poetical Frascator; nowhere does the great destroyer more patently reveal its power than in the appalling death rate it imposes upon the fetus.

J. W. Williams finds syphilis to constitute the most important single factor concerned in the causation of fetal death, it being responsible for 34.4 per cent of all the infant fatalities occurring between the period of viability and the first two weeks after birth, in his material, while in a series of cases studied by Barnes and myself at the Philadelphia



Fig. 2.—Same patient, showing condition March 19, 1924, again seven months' pregnant and awaiting delivery by section.

General Hospital there were 10 per cent stillbirths among 192 Wassermann positive women and only 1.8 per cent among 469 where the Wassermann reaction was negative. These figures deal only with stillbirths and not with abortion or death during the first two weeks of life and are therefore comparatively low as to death rate.

On the other hand, again referring to more of William's statistics, we find the encouraging information that of the children born to 169 women presenting a positive Wassermann during pregnancy, but not subjected to treatment of any sort, 51.5 per cent showed no evidence of syphilis, 33.7 per cent had a definite syphilis while in 14.7 per cent the results were doubtful.

In the series studied by Barnes and the writer, 48.4 per cent of syphilitic women gave birth to living and healthy children who disclosed no clinical or serological evidences of having been infected, up to the time of their discharge from the hospital.

These figures naturally lead to certain questions regarding the prognosis to, and management of, pregnant women suffering from syphilis, both as to the mothers themselves and their prospective infants.

1. What outcome of a pregnancy may be expected by a woman, who first learns that she has syphilis during her pregnancy, as a result of prenatal examination?

2. How may this outcome be affected both as to mother and child by intensive treatment during pregnancy?

3. What chance of producing healthy children in subsequent pregnancies, has such a woman provided adequate treatment be instituted and maintained?

4. What proportion of unrecognized and untreated syphilitics give birth to children showing no sign of the disease and persistently Wassermann negative?

5. What of Colles' law? Is there a possibility of paternal transmission of syphilis, the mother remaining free?

Let it be understood at the outset that none of these queries are to be answered definitely in this communication, but my conclusion from a study of the literature and my own experience will be very timidly presented.

Pregnancy occurring in an untreated syphilitic, may be reasonably supposed to eventuate in the birth of a living and healthy infant in about one-half of the cases, the child in this proportion showing no evidence of syphilis. About one-third of the patients produce syphilitic children either living or dead, stillbirths or macerated premature infants comprising about 10 per cent of the whole number in the statistics here studied. The remaining one-sixth are indefinite as to the presence or absence of syphilis.

These figures are far more encouraging than the generally prevalent pessimistic views regarding the transmission of this affection, would lead us to believe, but they are supported by the careful survey of several large series of cases and help to explain the fairly stationary incidences of syphilis in the world.

If one stops to consider the progressive rate of any disease which is directly and invariably transmitted from an affected mother to her offspring, it becomes readily apparent that if such hereditary transmission of lues were inevitable, the proportion of diseased persons would increase to an enormous extent within the epoch of but a few generations. Such, of course, has not been the case.

Next, how may the outcome of pregnancy in a syphilitic woman be affected by intensive treatment during gestation?

Here we have most encouraging results to present. A. C. Beek recently reported the end results of prenatal care in 1000 consecutive cases (Beek, A. C., End Results of Prenatal Care, (*Jour. Amer. Med. Assn.*, 1921, lxxvii, 457) among whom there were 30 cases of syphilis intensively treated. By intensive treatment is meant the weekly intravenous administration of salvarsan for six weeks; followed by six weekly injections of mercury alone. Among the 30 cases reported by Beek there resulted one stillbirth, one death 24 hours after birth and one in the seventh week of life from pneumonia. The first two fatalities were presumably due to syphilis, the third presumably not so, leaving a syphilitic death rate of 6.66 per cent. The remaining 27 babies did well, 6 of them showing some evidence (22.6 per cent) while the remaining 19 were well and presented no stigma of the disease (70 per cent +).

The third question propounded was what chance of producing healthy children in subsequent pregnancies has a syphilitic woman provided adequate treatment be instituted and maintained? Williams' standard of efficient treatment is defined as at least six doses of diarsenol followed by mercurials and iodides and the repetition of this treatment after the Wassermann reaction becomes negative and remains so for at least one year after the cessation of treatment. Williams studied 49 such patients, some of whom had enjoyed the most efficient treatment as outlined above, some had not received such intensive care but all had been at least actively and intelligently handled.

Before beginning treatment these 49 women had passed through 172 pregnancies with 102 fetal deaths, or 59.3 per cent. After treatment the same 49 went through 85 pregnancies with three fetal deaths or 3.5 per cent.

This query may then be definitely answered by saying that provided that adequate and persistent treatment be employed, a woman may reasonably expect the birth of a healthy child with but slightly greater chance of a fetal mortality than had she not suffered from the disease at all.

Next, what of Colles' and Profeta's laws, are they scientifically unsound and clinically disproved?

In 1837 Abraham Colles promulgated the view that a child might inherit syphilis from its father, the infective agent entering the ovum with the spermatozoon, and that the mother of such a child, not only might escape lues, but would remain immune to infection from her own child while others would be infected by it. This law came to receive general acceptance and not until 1907 and the Wassermann reaction, was any serious question raised as to its correctness although the discovery of the spirocheta by Schaudinn in 1903 had cast some doubt upon it. At present the extreme views of what one might call the Wassermannists still carry with them the bulk of medical opinion that Colles' law is untrue and that the mother of a syphilitic infant always was

a victim of the disease although it might be present in a latent form, having never given rise to clinical signs. This opinion was greatly strengthened by the fact that inasmuch as the spirochete is at least three times as large as the spermatozoon, it was manifestly impossible for the latter to convey so heavy a burden with it into the ovum. Furthermore, as a spore or larval state of the spirochete has not been demonstrated, it could not be proved that any immature form of this organism existed to be carried into the ovum.

I have long felt that clinical experience supports the older view of Colles, and that in spite of all the weighty objections against it, the facts speak eloquently for the truth of the theory of parental infection of the ovum. It was therefore with great pleasure that I found a similar opinion expressed by Professor Williams in his paper before the American Gynecological Society in 1920.

The behavior of the Wassermann reaction in pregnant women is so uncertain that it would seem as though some as yet unknown factors exercised a powerful influence. For example, is it not remarkable to suppose that the placenta may act as a barrier to the transmission of spirochetes themselves from child to mother but that a certain amount of syphilitic toxin may enter the maternal blood stream and so account for the feeble, fugitive and variable reaction sometimes observed in these women? Menten's interesting paper brought out the fact that in about one-half of her positive cases the reaction changed from positive to negative sometimes before and sometimes after delivery, without therapeutic or other reason for such change (Menten, Maud L.: *Amer. Jour. Obst.*, 1918, lxxviii, 514).

Finally, is the reverse of Colles' law, the formula devised by Profeta, correct or not? This view holds that a syphilitic woman may give birth to a child that is free from the disease and that never presents any manifestations of syphilis whatever.

That it is true needs no proof other than that already adduced in the foregoing statistics and in the commonplace fact that no disease or indeed any other physiologic or morphologic characteristic is invariably transmitted from parent to child,—a large proportion of the offspring, approximately one-half, escaping infection in the matter of syphilis.

The inevitable conclusion reached from an analysis of the relationship of venereal diseases to childbirth, is that with the steady increase of careful prenatal examination, the early recognition of these diseases and their active and persistent treatment, the power they possess of destruction of fetal life and maternal health is vastly diminished. It seems fair to assume that if equal progress be made in the next two decades as has just been recorded as taking place in the past two, these diseases will have largely lost their position as the chief destroyers of infant life.

MORPHINE AND MAGNESIUM SULPHATE AS AN OBSTETRICAL ANALGESIC*

BY THEODORE W. ADAMS, M.D., ANN ARBOR, MICH.

(*Instructor in Obstetrics and Gynecology, University of Michigan.*)

NITROUS oxide gas affords to the obstetrician a safe and satisfactory method of decreasing the pain of childbirth. Its proper administration, however, is attended with a definite expense for it requires the presence of a person familiar with the technic of anesthesia and a suitable machine is necessary for its administration. One or more of these factors are often inaccessible to the accoucher. There exists a place, therefore, for some method of relieving the pain of labor which is both simple and inexpensive.

Gwathmey,¹ in 1921, advocated the preoperative injection of magnesium sulphate and morphine as a means of reducing the amount of inhalation anesthetic necessary for operative procedures.

In the same year Curtis² reported the use of the same drugs for a similar purpose. He also reported a death following their use where, at autopsy, deleterious effects of the magnesium sulphate were found in the liver tissues. However, both Gwathmey and Curtis used two to four hundred cubic centimeters of a four per cent solution, a total dose of magnesium sulphate of over eight times as much as that used in any of the following experiments.

Gwathmey also found that magnesium sulphate given hypodermatically with morphine markedly prolongs and intensifies the sedative action of the latter drug. During the winter of 1923 magnesium sulphate in conjunction with morphine was given after operations to many of the patients in the gynecologic service of the University Hospital. It was found that one-eighth of a grain of morphine sulphate when given with two cubic centimeters of a twenty-five per cent solution of magnesium sulphate afforded greater postoperative relief than a quarter of a grain of morphine given alone.

At the time the following work was undertaken at the maternity ward of the University Hospital, no reference to the use of magnesium sulphate and morphine as an obstetrical analgesic could be found in the literature. Because of their marked effect of post-operative pain it was decided to study the action of these drugs on labor pains. Since then, Gwathmey³ in conjunction with Donovan, O'Regan and Cowan, published an article on "Painless Childbirth

*From the Department of Obstetrics and Gynecology, University of Michigan.

by Synergetic Methods," in which morphine and magnesium sulphate play an important role.

METHOD

A twenty-five per cent solution of chemically pure magnesium sulphate was kept in stock. The required amount of this solution as the occasion demanded was sterilized by fractional boiling. It was then drawn up into a sterile hypodermic syringe and the desired amount of morphine sulphate added. The injections were made intramuscularly, the deltoid muscle being the common site of injection.

The cases used in the following experiments were in no way selected. They were composed of the general run of maternity cases entering the obstetrical ward, in which labor had started and where contractions were of such a nature as to cause the patients to complain of pain.

In all, morphine and magnesium sulphate were given to sixty patients. Of these six were multiparae and fifty-four primiparae. The youngest patient was fourteen and the oldest thirty-nine years of age. The average age was twenty years. All were at term and all started labor spontaneously.

The total length of labor was not prolonged. As can be seen from the comparative table, Table I, it was even slightly shorter than the average length of normal labor as found by Williams⁶ and DeLee³.

TABLE I
COMPARATIVE LENGTH OF LABOR

	1ST STAGE			2ND STAGE			3RD STAGE			TOTAL		
	Present Series	De-Lee	Wil-liams	Present Series	De-Lee	Wil-liams	Present Series	DeLee	Wil-liams	Present Series	De-Lee	Wil-liams
Primiparae	14 hr.	16 hr.	16 hr.	2 hr.	1¾-3 hr.	1¾-2 hrs.	14 min.	few min. to hours	¼-½ hr.	16¼ hrs.	18 hrs.	18 hrs.
Multiparae	5 hr.	12 hr.	11 hr.	45 min.	¼-½ hr.	1 hr.	15 min.	few min to hours	¼-½ hr.	6 hrs.	13 hrs.	12 hrs.

Postpartum bleeding was not excessive. Even if one case in which sixty ounces of blood were lost due to a deep cervical laceration be included, the average amount of blood lost following the birth of the baby was still within the normal limits. In no case except the one just mentioned was there postpartum hemorrhage either immediate or delayed. The uterus at all times retained a good tone and no abnormal tendency to relaxation was noted. Table II gives the average amount of blood lost as compared with that found by various authors in normal deliveries.

Since Cron's¹ work on pituitrin in the third stage of labor it has

TABLE II
COMPARATIVE POSTPARTUM BLEEDING

PRESENT SERIES	DELEE ⁶	WILLIAMS ⁷	CRON ⁸
294 c.c.	240-300 c.c.	343 c.c.	255 c.c.

been the custom in a great many deliveries at the University Hospital to give one ampule of pituitrin intramuscularly following the end of the second stage. Thirty-five of the sixty cases in the present series were thus treated. These showed an average loss of 330 cubic centimeters as compared with an average of 270 cubic centimeters in the twenty-five cases where no pituitrin was given. Therefore, it is not felt that the pituitrin lessened in any way a tendency for the magnesium sulphate and morphine to increase postpartum bleeding, did it possess such an action.

In no case was there any deleterious effect to the mother either immediate or delayed, which could in any way be attributed to the magnesium sulphate and morphine. There were no cases of sloughing at the site of injection and no increased tendency to nausea and vomiting. There was no mortality.

Eighty-five per cent of the children cried spontaneously within one minute of birth. In seven, or 13 per cent, the children were slightly cyanotic at birth, although the heart rate was normal and regular. These children all cried in less than five minutes after slight external stimulation and in none was artificial respiration necessary. In one case (2 per cent) the child was born in pallid asphyxia, gasped a few times but could not be resuscitated. Autopsy revealed an enlarged thymus and the blood Wassermann was four-plus. Although this must be tabulated as a fetal death, it is not felt that death was due to the maternal medication.

In a parallel group of cases, where no magnesium sulphate and morphine had been given, 82.2 per cent cried spontaneously, 13.5 per cent showed evidence of slight asphyxiation and 4.3 per cent were either born dead or in pallid asphyxia.

TABLE III
COMPARATIVE ASPHYXIATION

	BREATHED SPONTANEOUSLY	SLIGHT ASPHYXIA	PALLID ASPHYXIA OR STILLBIRTH
Without medication	82.2%	13.5%	4.3%
With medication	85 %	13 %	2 %

Spontaneous delivery occurred in fifty-four, or 90 per cent of the cases. Five patients, or 8 per cent, were delivered by forceps, and in one case delivery was by cesarean section. In this latter case the mother had a simple flat pelvis and after a reasonable test of labor the head failed to engage.

The indications for forceps extraction were as follows: contracted outlet, funnel pelvis, 2 cases; malposition, unrotated O. P., 2 cases; large child ($10\frac{1}{2}$ pounds), 1 case.

In the series of two hundred ninety-nine cases without medication used as controls, delivery by means of forceps was indicated in twenty-nine or 9.8 per cent of cases.

At first the dose used was one and one-half cubic centimeters of a twenty-five per cent solution of magnesium sulphate and one-eighth grain of morphine. Although the cases treated in this way showed some diminution of pain, it was not until the dose was increased to two cubic centimeters of magnesium sulphate and one-sixth grain of morphine that the more favorable results were obtained. In no case was a single larger dose given. In thirteen cases (21.5 per cent) where the effect of the medication seemed favorable but not lasting, the dose was repeated. The average dilatation at the time of the second dose was four and one-half centimeters.

RESULTS

It is an extremely unsatisfactory task to tabulate the effect of any medication on pain. Both the word of the patient and the external manifestations must be taken into consideration. Under conditions apparently the same as regards the intensity of the pains and what they accomplish, one patient will suffer extremely while another with a different nervous organization will to all appearances suffer very little.

It is a well-known fact that a patient who is suffering pain if kept in a quiet, darkened room will appear to bear up better than if continually bothered by repeated examinations. It is with this handicap that these experiments were carried out, as all patients confined at the maternity ward of the University Hospital are used for teaching material. Each case immediately upon entrance is assigned to a senior medical student whose duty it becomes to follow the case closely by repeated rectal and abdominal examinations. It will be seen, therefore, that these experiments were carried out under conditions far from perfect so far as the patient's state of mind was concerned.

The results of the experiments may be outlined as follows:

(1) No result.—In this class were placed all patients in whom no sedative effects were noted following medication.

(2) Poor result.—These patients received some relief, especially relaxation between contractions, relief of backache, etc., but the contractions could still be felt by the patient and the relief lasted no longer than two to two and one-half hours.

(3) Fair result.—In this group there was some increase of pain at the time of the contractions, but the patient rested comfortably

between contractions. The effect here lasted longer than in the preceding group but gradually wore off as the end of the first stage approached.

(4) Good result.—Here there was great relief from pain both during and between contractions. However, the patient remained conscious and felt a moderate, cramplike sensation at the time of the uterine contractions. In this class the effects lasted until well into the second stage of labor.

(5) Excellent result.—In this class were placed all patients who experienced practically no pain following medication until the fetal head began to distend the perineum. The greater majority of such patients remained in a semi-conscious state, although gentle palpation of the abdomen revealed uterine contraction and relaxation to be continuing normally.

In tabulating the cases according to the above method it was found that the effect depended to a great extent on what time in labor medication was given. The cases have therefore been divided into two groups. In the first the cervix was at least six centimeters dilated at the time of the first dose, that is, the patients were well advanced in the first stage of labor before being given medication. In this group the results were far from satisfactory.

In the second group the medication was given before the cervix was five centimeters dilated, the average dilatation at the time of the first dose being two and one-half centimeters. In this group the results were quite gratifying.

Table IV gives the number and percentage of cases falling in each class.

TABLE IV
COMPARATIVE RESULTS OF MEDICATION

	NO RESULT		POOR RESULT		FAIR RESULT		GOOD RESULT		EXCELLENT RESULT	
	No.	%	No.	%	No.	%	No.	%	No.	%
Medication given after cervix was 6 cm. dilated	0	0	3	42.8	4	57.2	0	0	0	0
Medication before cervix was 5 cm. dilated	4	8	7	13.2	12	21.8	15	28.5	15	28.5
Total	4	6.6	10	16.6	16	26.6	15	25	15	25

From this it can be seen that 6.6 per cent received no result from the medication whatsoever while 93.4 per cent received varying amounts of relief. Twenty-five per cent had extremely easy labors experiencing practically no pain at all until late in the second stage when the pain was very satisfactorily controlled by ether inhalation. This latter procedure was used in the last of the second stage in practically all cases.

It was also interesting to note the increase in relief afforded by ether inhalation in cases where previous medication had been given.

REMARKS

It is realized that the number of cases here reported is far too small to lead to any definite conclusions. However, it is fair to state that in this series at least, hypodermic injection of morphine and magnesium sulphate did, in a large majority of the cases, have a definite sedative action on the pains of labor, without in any way increasing the fetal or maternal morbidity or mortality. It is further felt that this form of treatment possesses possibilities as a simple, inexpensive and apparently harmless method of obstetrical analgesia.

REFERENCES

- (1) *Cron, R. S.*: AM. JOUR. OBST. & GYNEC., March, 1921, iii, 300. (2) *Curtis*: Jour Am. Med. Assn., 1921, v, No. 77, p. 1492. (3) *De Lee*: Principles and Practice of Obstetrics, Ed. 3, p. 136 and 789. (4) *Gwathmey*: AM. JOUR. OBST. & GYNEC., October, 1923, vi, p. 456. (5) *Gwathmey*: Jour. Am. Med. Assn., August 6, 1923, No. 77. (6) *Williams*: Obstetrics, Ed. 5, pp. 262 and 335.

THE PLACENTAL INFARCT AND ITS RELATION TO THE ETIOLOGY OF DEFORMED BABIES*

By JOHN E. TALBOT, M.D., WORCESTER, MASS.

(*Obstetrician, Memorial Hospital.*)

THE placental infarct may be said to be the key unit of much of the pathology of obstetrics. In a recent paper¹ I endeavored to show its significance in relation to much of the pathology of the products of conception. I wish to set forth in detail my observations on one very important phase of the problem, which tend to explain the etiology of deformed babies. In order that the accompanying drawings may be more intelligible, it seems best to explain again the series of observations which have led me to believe that the placental infarct is the result of hematogenous infection of the maternal blood vessels of the placental site.

My observations depend upon the basic conception that a normal placenta enlarges concentrically by proliferation of tissue on its edge. A normal full term placenta is therefore one with the cord attached to the center of the circle made by the circumference of the placenta. The point of cord attachment represents the earliest tissue grown or the beginning of the pregnancy. The tissue on the edge of the placenta farthest away from the cord is the most recent tissue grown.

*Read before the Brooklyn Gynecological Society, Feb. 1, 1924.

Should any injury occur to an area on the proliferating edge of the placenta in the first month of the pregnancy, such an injury would inhibit or prevent further development at that point. Compensatory growth would occur on the uninjured edge to supply the needs of the growing fetus. The cord of such a placenta would therefore be attached very near the edge and the placenta would be of the typical battledore type.

By this deduction it is apparent that the distance from the infarct or injury to the base of the cord, *when the injury is on the edge of the placenta*, gives a reasonable estimate as to the time in the pregnancy when the injury originated.

It is conversely true that a placenta which has the cord attached at or near the edge is the result of some early injury to the placental edge. This statement is supported by the fact that the placental edge nearest the cord attachment generally presents evidence of damage by the presence of white infarction or an absence of active blood vessels on the fetal surface of the damaged tissue.

The work of Pinard² has shown the nature and process of development of the white infarct. He describes "the lesion as characterized by the appearance of hemorrhages which are converted into white infarcts. The primary lesion is hemorrhagic in nature; the white infarct is secondary. In the same placenta may be found recent and old foci and thus very easily the different degrees in the evolution of the placental hematoma may be followed." J. W. Williams³ describes this evolution as a coagulation necrosis. In January, 1923, McNalley and Dieckman⁴ reported work which verified the work of Pinard and found that the white infarct was the end result of a hemorrhagic lesion.

This work is very important because it shows that the lesion is discrete, often repeated in the same placenta and that the white infarct is the end result of an earlier lesion which originated weeks or months before the birth of the placenta.

Is the cause of the hemorrhagic lesion primarily in the placenta or in the uterine blood vessels of the placental site? Willson⁵ concludes from his investigations that "uteroplacental apoplexy is caused by the inundation of the *uterine wall* with a toxin of the nature of a hemorrhagin. Acting on the tissues of the decidua basalis, it produces small areas of hemorrhage which, coalescing, determine retroplacental bleeding and consequent placental separation." In association with this condition he points out that there are similar hemorrhagic areas in other organs of the body. This evidence tends to show that the primary lesion causing the hemorrhage is in the uterine blood vessels.

Since early infarcts are hemorrhagic in nature, it is fair to assume that they may have some relation to uterine bleeding in pregnancy.

Uterine bleeding during pregnancy is a very common event. It is often described as threatened miscarriage. In many cases a miscarriage actually follows such an event, sometimes immediately, more often several days elapse before the products of conception are passed off. Later in pregnancy the event is described as antepartum hemorrhage. Any external bleeding which comes from a hemorrhagic lesion of the placental site must involve and injure the proliferating edge of the placenta and cause a separation. Such an injury would in most cases result in a cessation of further proliferation at the point of injury. The cause of these hemorrhagic lesions is left in doubt. It is the clinical side of this problem on which I have made observations.

My method has been in cases in which there has been bleeding, to observe whether or not there was a white infarct or evidence of damage on the edge of the placenta which would correspond in time by its position in relation to the point of cord attachment to the time in the pregnancy when such bleeding occurred. I have observed 46 cases in which the bleeding spell was so recorded on the placenta. It must be remembered that every infarct does not cause external bleeding. I believe, however, that every bleeding spell which comes from the placental site will leave evidence of damage on the edge of the placenta.

The next step in the problem is to look for evidence as to the cause of the primary hemorrhagic lesion in the uterine blood vessels. There is no better example to emphasize the relation of infection to bleeding in pregnancy and miscarriage than our experience in the influenza epidemic. However, the problem presented itself to me from a different angle.

It has long been my belief that toxemia of pregnancy is due to chronic sepsis. In the disease complex of toxemia of pregnancy infarcts of the placenta are very frequently found. It is also true that antepartum hemorrhage is frequently associated with toxemia of pregnancy. This association suggested the probability that placental infarcts were due to infection of the placental site. Endeavors to prove this point by bacteriologic examinations of placental lesions have not proved successful. De Lee⁶ isolated a staphylococcus from an infarct in a single case twenty years ago.

If infarcts result from foci of chronic infection they would in all probability result from acute infection also. By constantly watching for it, I found that bleeding spells in pregnancy are very frequently preceded by acute infection. During the last three years I have observed twenty-six cases in which uterine bleeding during pregnancy was preceded by demonstrable acute infection.

Realizing that in order to have external bleeding the hemorrhage must be sufficient to dissect its way downward between the chorion

and uterine wall to the vagina, I have also attempted to determine whether or not acute infections were recorded by contemporaneous infarcts on the edge of the placenta without bleeding and I have acquired fifty-seven cases in which this was true. One of the most interesting was a case of lobar pneumonia at the fourth month which fortunately went on to full term.

This clinical evidence therefore tends to show three facts:

First, uterine bleeding is preceded by acute infection frequently enough to suggest strongly that the bleeding is the result of the infection.

Second, bleeding from the placental site is recorded on the edge of the placenta by the white infarct or cessation of growth at that point.

Third, acute infection in the head is often recorded on the edge of the placenta by the white infarct or cessation of growth and is therefore strengthening evidence in support of the contention that uterine bleeding is due to infection.

If bacteria from acute infection in the head can cause these lesions by the hematogenous route, bacteria from foci of chronic sepsis can do the same thing. The great frequency of infarcts in the placenta is in keeping with the great frequency with which chronic infection is found in the teeth and tonsils plus the incidence of acute infections. It is well recognized that bacteria can migrate from areas of chronic sepsis without giving any outward evidence of the fact. It is equally possible for an infarct to form without giving outward evidence. It is therefore plain that many infarcts may form without external evidence. Because many placentas present many infarcts without external evidence is no reason for doubting that most infarcts are alike as to origin.

Besides this clinical evidence that the infarct is the result of hematogenous infection of the maternal blood vessels of the placental site, there is also histologic evidence found in cases in which the placentas were examined *in situ*. Evidence of infection of the placental site was evident in two cases on record.^{7, 8}

An application of this principle occurred to me in connection with deformed babies. The frequent association of deformed babies with syphilis gave rise at one time to the belief that a deformed baby was evidence of syphilis. The Wassermann test has corrected this view of the situation. However, there is in this frequent association of syphilis with deformed babies the suggestion that the deformity is often an acquired attribute and not hereditary and that it may result from very early infection of the embryo.

The embryo within the first forty days of its development consists in a series of bundles of cells, each bundle having the power of further differentiation into the several parts of the body. Injury to any

one of these bundles would result in a lack of development of that part with distortion of contiguous parts.

The more common deformities are anencephalia, high spina bifida, hydrocephalus, hare-lip and the absence or deformity of some part in the region of the head.

This very marked predominance of malformation in the region of the head is significant when it is considered in relation to the fetal circulation. It will be remembered that the reason that the baby's head is the largest and best developed portion of the body is because the most direct route for the blood coming from the placenta is to the head. If this route brings more food material and oxygen from the placenta to the head, it would likewise account for the increase in damage in the head if the damaging element came from the placenta.

Adopting this view of the situation I determined to watch the placentas of deformed children to see whether or not there was an infarct or evidence of damage to the placenta near the base of the cord to correspond in time to this early damage to the embryo.

I can report twenty consecutive cases of deformed babies which show evidence of placental damage near the base of the cord and are consistent with the theory advanced. The histories and findings in these cases are as follows:

CASE 310. Primipara, age twenty-six. Patient was not seen previous to delivery. Vomiting persisted throughout pregnancy. No bleeding spell. She does not remember any acute infections in first part of pregnancy but has been subject to rheumatism in both arms. Symptoms of toxemia occurred during last week of pregnancy. Blood pressure and urine normal.

At seven months she was delivered normally of a stillborn macerated anencephalic fetus associated with hydramnios. Placenta delivered normally. Cord had relative central attachment with large white infarct at base of cord on fetal surface. No drawing made. The origin of this infarct was a small retroplacental hematoma which did not involve the proliferating edge and therefore did not prevent the concentric enlargement of the placenta.

Subsequent to delivery x-rays of her teeth showed apical areas on both lower left bicuspid which were crowned and the upper right bicuspid showed necrosis of bone. Tonsils were red and adherent to pillars. Septic teeth were extracted and necrotic bone curetted. Later, Nov. 22, 1920, her tonsils were removed.

March 28, 1922, she was delivered of a normal 8 lb. 12 oz. baby. In the middle of December 1921 she had a severe cold which put her in bed for three days followed by a slight showing of blood. No rise in blood pressure, urine normal and no toxic symptoms throughout this pregnancy. There was an area of damage on the placenta consistent with date of the bleeding spell.

CASE 345. Primipara, age twenty-nine. First seen at three months. A bleeding spell had occurred at seven weeks' menstrual date. No record of associated acute infection. No marked toxic symptoms, no rise in blood pressure, and urine was negative throughout. Hydramnios developed rapidly during the sixth month. She was delivered of a stillborn anencephalic fetus, breech presenting. Manual extraction of placenta was necessary. Placenta showed cord attached to edge. No drawing made.

Patient had been subject to tonsillitis and both tonsils were large, the left adherent to pillars. X-ray showed two apical areas on lower left first molar. This tooth was extracted at the fourth month of her second pregnancy which terminated in a normal delivery of an 8 pound 6 ounce baby, Nov. 6, 1921.

CASE 398. Primipara, age twenty-eight. First seen at two months. Last menstrual date March 7, 1920. On April 9 and May 1, she had slight showing of blood. On May 9 another bleeding spell. Extrauterine pregnancy was suspected and at an abdominal operation an acute appendix was removed. Tonsils had been removed at age of 12. X-ray of teeth showed bone destruction at apex of upper left lateral incisor. This was extracted in July. No rise in blood pressure, urine normal and no toxic symptoms after extraction of tooth. Delivery was normal of a 6 lb. 12 oz. baby on Dec. 8, 1920. The right foot showed congenital valgus. The cord was attached to the placenta about one inch from edge, which edge showed two white infarcts. This case has been previously reported (12).

CASE 03. Primipara age thirty-five. Reported by courtesy of Dr. O'Connor. On Jan. 3, 1921 she had what she thought was a period but more scanty than usual. In April she flowed for two weeks, stopped one day and then flowed for two more weeks. Motion began May 16. Membranes ruptured on Sept. 7 and on the 15 she was delivered by version of a 6 pound baby. Baby had only a rudimentary tragus on the right side. The left pinna seemed perfect. The placenta was the typical battledore type with the cord attached to the very edge. This edge showed white infarction. No rise of blood pressure, urinary disturbance or toxic symptoms throughout pregnancy.

Although there was no history of acute infection in the case, the patient had been subject to tonsillitis and neuralgia of the right shoulder. Examination showed that both tonsils were large and although the upper teeth were all false, the lowers were badly decayed and the gums much inflamed. This case has been previously reported (1).

CASE 04. Primipara age thirty-two. Reported by courtesy of Dr. O'Connor. Her last period was on Feb. 4, 1921. Motion felt July 1. She had very large tonsils. Four of her teeth were crowned, two molars were very carious, a retained root was visible in the gums, all associated with pyorrhea. She had been subject to neuralgia of the face. Nausea lasted until the sixth month. Her blood pressure and urine were normal at entrance to the hospital. She remembered that she had had a bad cold at the time she skipped her first period. No bleeding occurred.

On Sept. 24, 1921 she was delivered of twins. One baby was living and weighed 5 pounds. The other was an anencephalic with cervical spina bifida and macerated.

The placentas were separate and not contiguous. The placenta of the living twin seemed normal except for a few small infarcts. The placenta of the anencephalic twin was less than half the size of the other placenta and presented a V-shaped indentation in the circumference, the apex of which was almost contiguous with the base of the cord. A large white infarcted area could be noted in the opposite side of the placenta. This case has been previously reported (1).

CASE 05. Primipara. Reported by courtesy of Dr. O'Connor. Patient was not seen by me. No history of any event in early pregnancy. Teeth, uppers false, lowers very poor. Tonsils not mentioned. Patient was delivered of a baby with lumbar spina bifida by mid-foreeps on Nov. 27, 1921. The cord had a relative central attachment to the placenta. At the base of the cord was a white scar with well defined margin and somewhat depressed below the level of the fetal side of the placenta. Histologic examination showed chronic inflammatory tissue running deep into the placenta.

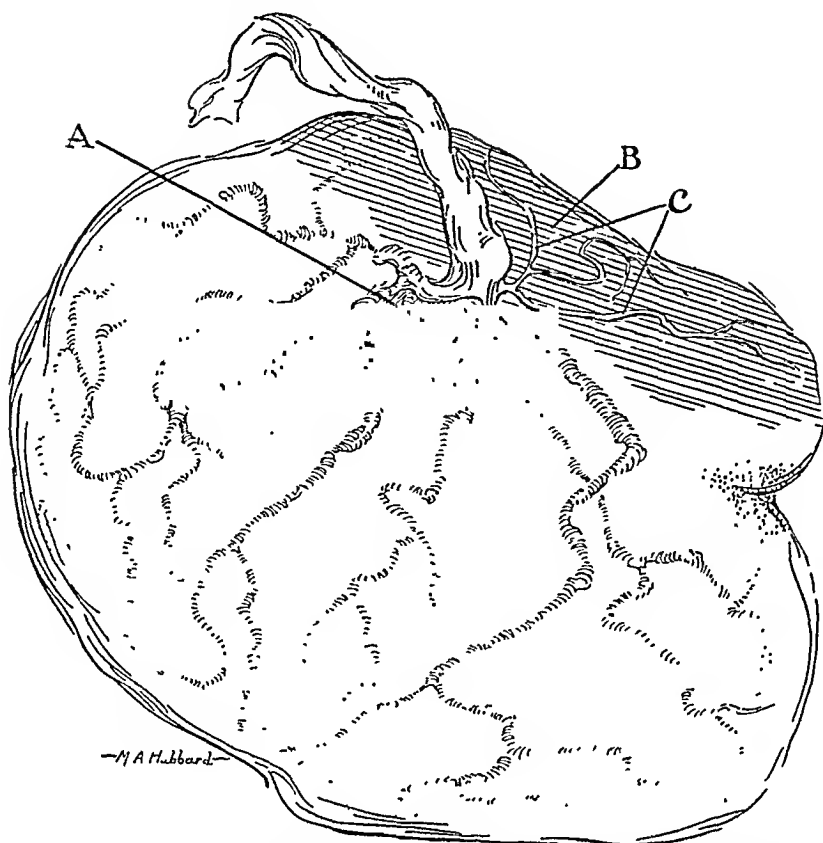


Fig. 1.—Case No. 494. Baby anencephalic. *A*, white infarct at base of cord on fetal surface; *B*, an area of damaged placental tissue; *C*, empty blood vessels.

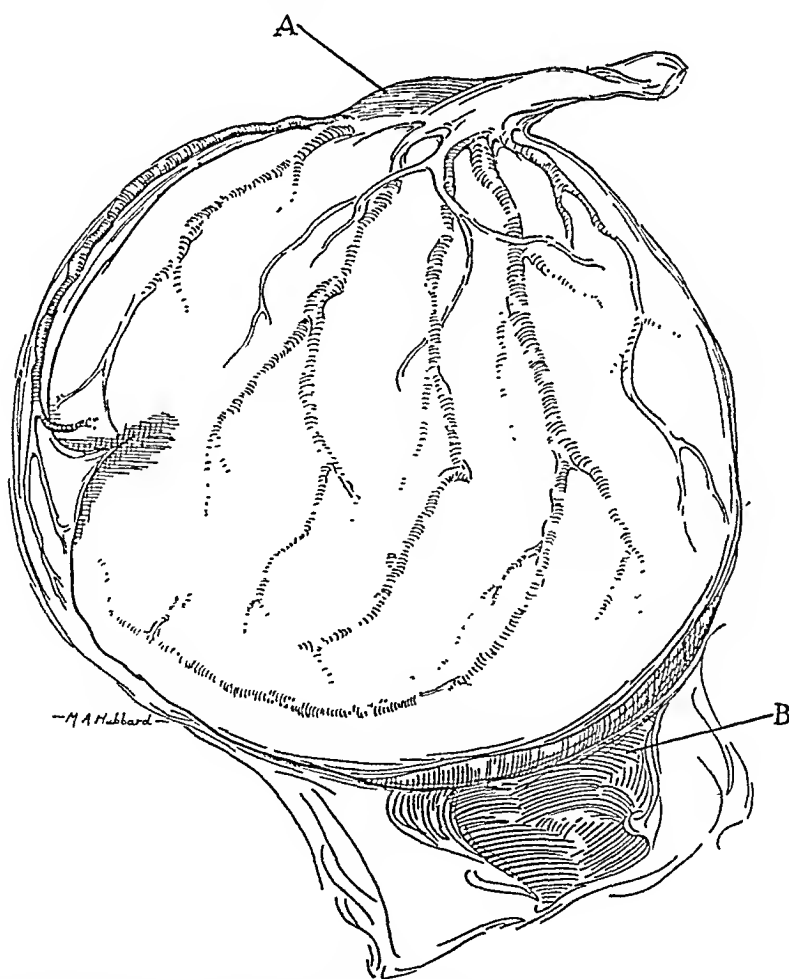


Fig. 2.—Case No. 07. Congenital valgus. *A*, white infarct at base of cord. Baby had an unilateral congenital valgus. *B*, opening in membranes at edge of placenta and opposite infarct *A*.

CASE 481. Primipara, age twenty-five. First seen at 7½ months. Last period Jan. 22, 1921. She became sick with grippe Feb. 14 and was in bed two weeks. When first seen the abdomen resembled a full term pregnancy. No fetal heart heard. Diagnosis of hydramnios and deformed baby made at that time. Under marked catharsis, the hydramnios gradually disappeared and the fetal heart became audible in left lower quadrant. Blood pressure rose to 140-100 on October 21, but returned to normal. Urine negative. Mild toxic symptoms present. Motion felt middle of June.

Normal delivery occurred on Dec. 1, 1921 of an apparently healthy child. Marked cyanosis occurred when the baby was given water. The baby died on the fourth day of pneumonia. Autopsy showed that the esophagus did not open into the pharynx but into the trachea. The placenta was unique in the series as it did not show a discrete lesion near the base of the cord. The cord was centrally attached but there was an absence of blood vessels on the fetal surface on opposite quadrants of the placenta and the tissue in these two regions was much firmer than normal placental tissue.

This patient has excellent teeth. Her tonsils, however, had been lanced several times on account of quinsy sore throats. Appendectomy was done in 1919. She has had her tonsils out and on Oct. 14, 1923, gave birth to a normal 8 pound baby after a normal pregnancy. The placenta was symmetrical and the cord was attached very near the center of the placenta.

CASE 494. Multipara, age thirty-three. First seen at 6½ months. Scarlet fever followed by otitis media as a child. Teeth excellent, tonsils very large. Myocardial weakness was evident in both her pregnancies. Both pregnancies were toxic at full term. A miscarriage occurred at three months between them. A few months before the fourth pregnancy started, she had been in bed with inflammatory rheumatism for 53 days.

Last period of her fourth pregnancy May 28, 1921. During the last of June she had a very severe sore throat with recurring sore throats during the next two months. Vomiting persisted throughout this pregnancy. No rise in blood pressure. Urine negative. At 7½ months she was found to be in labor. A diagnosis of hydramnios was made with probable deformed baby and probable infarct at base of cord. The baby was anencephalic and a sketch of the placenta accompanies this article (Fig. 1). This case has been previously reported (No. 1).

CASE 07. Primipara, age thirty-seven, with a blood pressure of 155-95, a trace of albumin in a catheter specimen of urine. She had sound teeth from inspection but with marked pyorrhea. Tonsils were adherent and anterior pillars red. Delivery was normal of a baby with right congenital valgus. The cord attached to the edge of the placenta with a white infarct at its base. Note also that the placenta was of the previa type. (Fig. 2.)

Six days following delivery patient had an acute sore throat followed by an elevated temperature for the next three weeks. A mass developed in the left lower quadrant. Patient left hospital against advice.

CASE 08. Multipara, age thirty-eight. Reported by courtesy of Dr. Adams. First pregnancy, craniotomy. Second pregnancy, breech stillborn. Third pregnancy, labor induced at 7 months. Baby died. Fourth pregnancy, miscarriage at 3 months. Fifth pregnancy, living. Born on way to hospital to have a cesarean. Sixth pregnancy, cesarean section. Baby living. Seventh pregnancy, notwithstanding the fact that the tubes had been tied off at the last delivery, the patient presented herself at the hospital pregnant again. Patient had nine carious teeth with much pyorrhea and tonsils were inflamed. No definite history of the early events in the pregnancy was obtained. She stated that she had had many colds during this

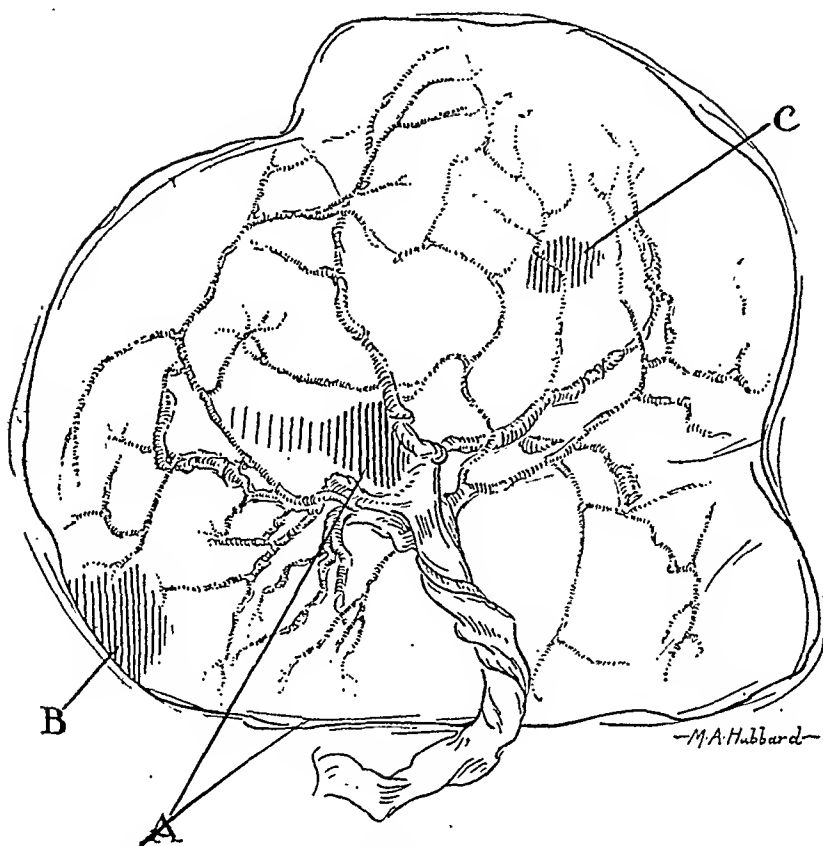


Fig. 3.—Case No. 535. Baby anencephalic. A, white infarct on fetal surface at base of cord; B and C, probably contemporaneous infarcts with no clinical fact associated.

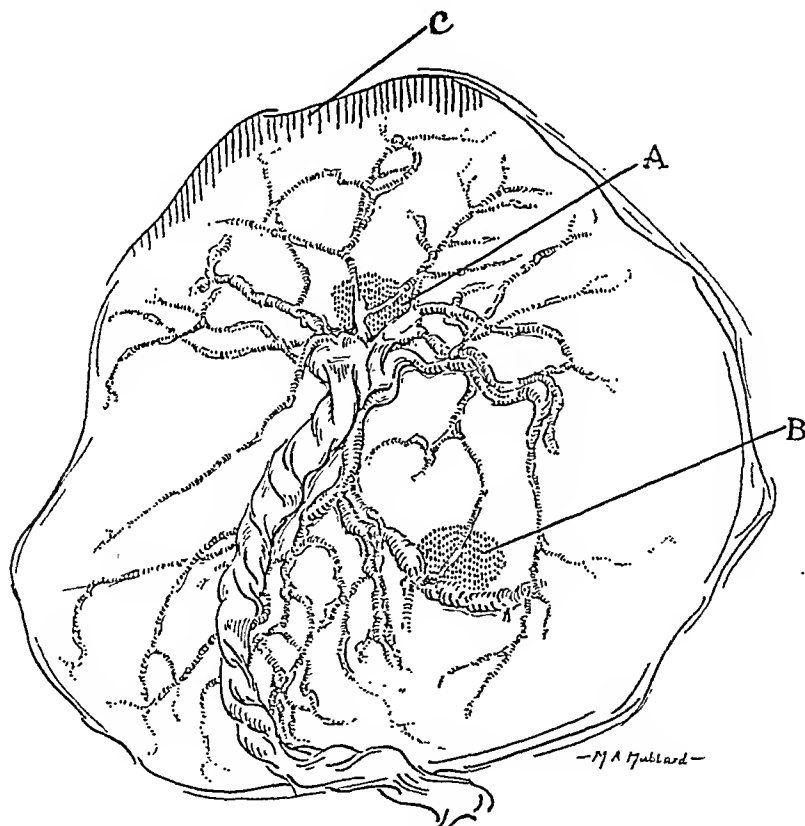


Fig. 4.—Case 09. Harelip. A, large white infarct on maternal surface, involving base of cord; B, large white infarct on maternal surface; C, infarcted edge of placenta.

pregnancy. Another cesarean was done. The baby had toes on the left foot and only the great toe on the right foot. The cord was attached to the edge of the placenta with white infarction along the near edge.

CASE 535. Primipara, age thirty-three. First seen at six months. She had had no serious illnesses but was subject to sore throats. At her first examination moderate hydramnios was present. No fetal heart audible. Her last period was Nov. 17 and she had had some bleeding on January 4. She had had occasional vomiting, numbness of the right hand, occasional dizzy spells and slept poorly. No rise in blood pressure and urine negative. On July 4 she delivered herself normally of an anencephalic baby with cervical spina bifida. The placenta was partially adherent. The cord had a relative central attachment and there was a large white infarct at the base of the cord. (Fig. 3.) Complete x-ray examination of her teeth showed no apical area. The tonsils were small and adherent to pillars.

CASE 09. Multipara age twenty-eight. Reported by courtesy of Dr. Hale. Patient was not seen by me. Her family history was negative as to deformities but several cousins had been mentally deficient. Her first four babies had been normal. The fifth baby, two and a half years old, had a hare-lip on the right side. Her sixth and present pregnancy resulted in another hare-lip baby, the left side being affected this time. The baby was born July 11, 1922. In March, 1921 the patient had had all her teeth out. Previous to that time she had had many old roots and much pyorrhea. In this connection I have had seven patients who had had all their teeth out in whom retained roots were visible in four and were shown to be present with infection by x-ray examination in three. There had been no tonsillar history and the tonsils had not been removed. The cord showed a relatively central attachment. There were no infarcts on the fetal surface. On the maternal surface and almost directly under the base of the cord was a large hard deep white infarct. (Fig. 4.)

There was no evidence to identify the time when this infarct occurred. However the author feels justified in view of the evidence in the other cases in including this case in the series because there was placental damage involving the base of the cord in association with a deformity in the baby.

CASE 011. Multipara, age thirty-six. Reported by courtesy of Dr. O'Connor. Her five previous pregnancies had been normal. Her tonsils were large and she had nine retained tooth roots flush with the gums, with much pyorrhea. Last period Jan. 1, 1922. During the last of January and the first of February she had a very severe cold. She had been troubled with toothache during the pregnancy, excessive vomiting in the early months and during the last three weeks. Blood pressure, 150-85, on admission. Wassermann was negative. She ran an elevated temperature for nine days after delivery on Nov. 13, which was very difficult because the baby was macerated and had ascites. Autopsy showed a heart with one auricle. There were minute hemorrhages in the pleura and the mesenteric lymph glands were enlarged. The cord was attached near the edge of the placenta with a white infarct at the base of the cord and damaged placental tissue between that infarct and the edge. (Fig. 5.)

CASE 575. Primipara, age thirty-one. First seen in eighth month. Had quinsy sore throat three years ago. Tonsils small. Teeth show one gold crown, with pyorrhea. Last period March 3, 1922. On May 15 she had a bleeding spell, four bleeding spells in June, six in July and again on Nov. 28. There was no rise in blood pressure, no toxic symptoms and urine was negative. Although due on Dec. 10 labor did not start until Dec. 27. Christmas day was the last time she felt the baby, which was stillborn and showed congenital varus of the right foot. The

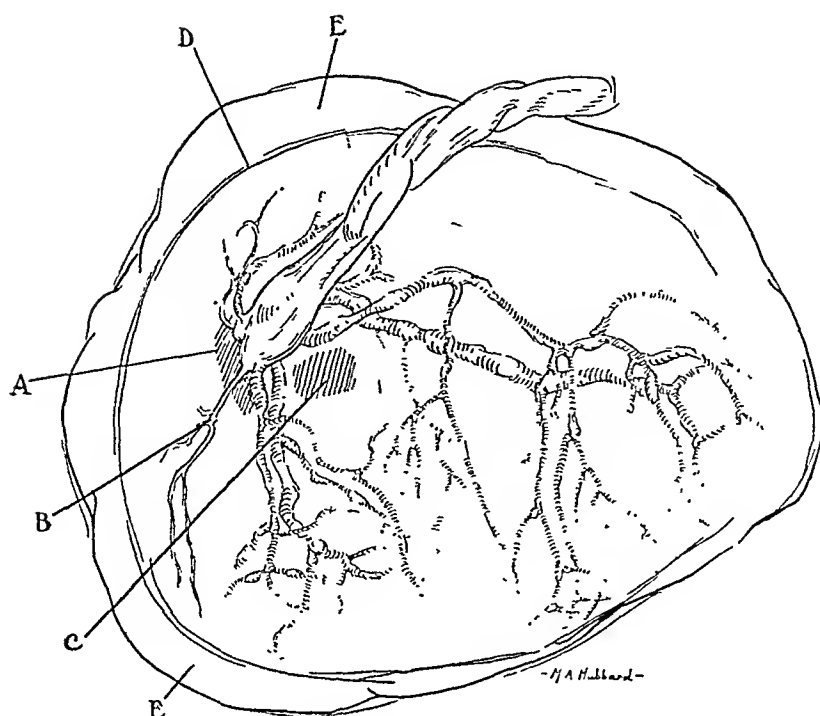


Fig. 5.—Case No. 011. Baby, congenital heart (single auricle) and ascites. *A*, white infarct at base of cord. (Note absence of active blood vessels.) *B*, empty blood vessel; *C*, white infarct on fetal surface; *D*, white line of damage; *E*, rim of placental tissue grown since damage *D* took place, and containing no surface blood vessels.

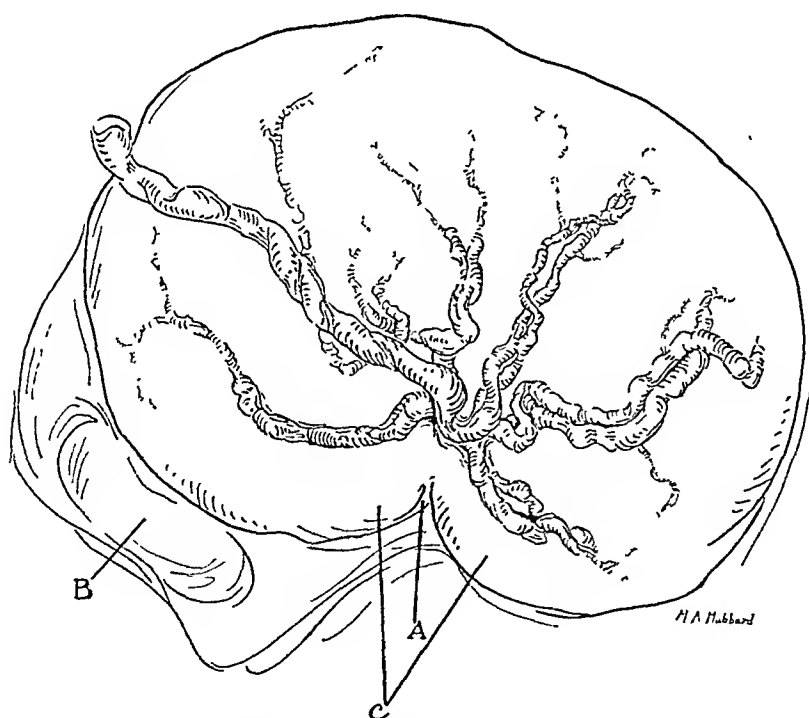


Fig. 6.—Case No. 575. Right congenital varus. *A*, indentation in edge of placenta near base of cord corresponding to bleeding spell of 44 days menstrual time; *B*, opening in membranes on edge of placenta; *C*, infarcted tissue.

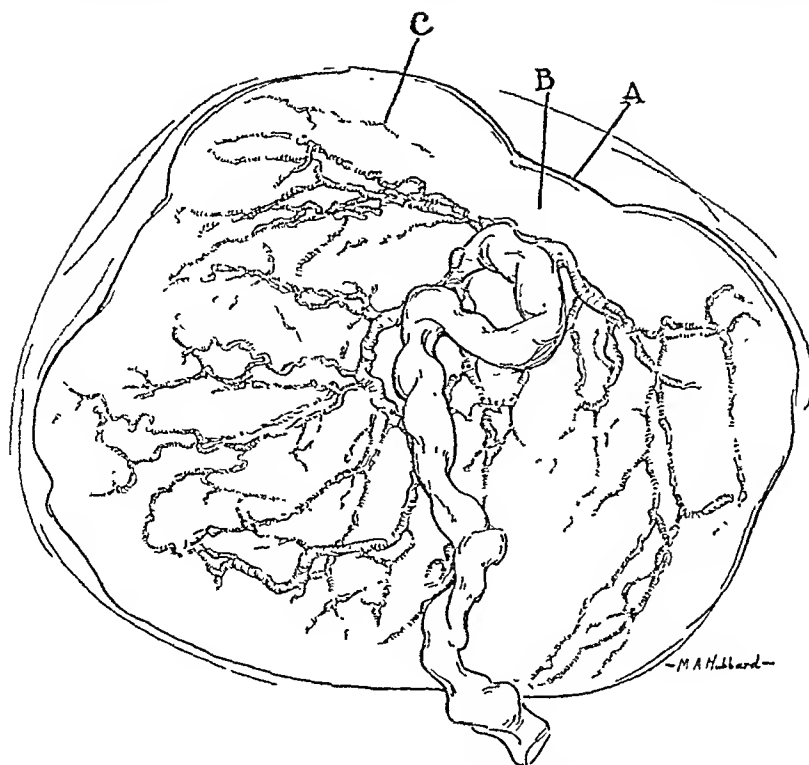


Fig. 7.—Case No. 013. Baby anencephalic. A, edge of placenta $\frac{3}{4}$ inch from base of cord; B, area of placental tissue with no blood vessels on fetal surface and firmer in consistency than the rest of placenta; C, small filled blood vessel which dips beneath fetal surface to reach cord.

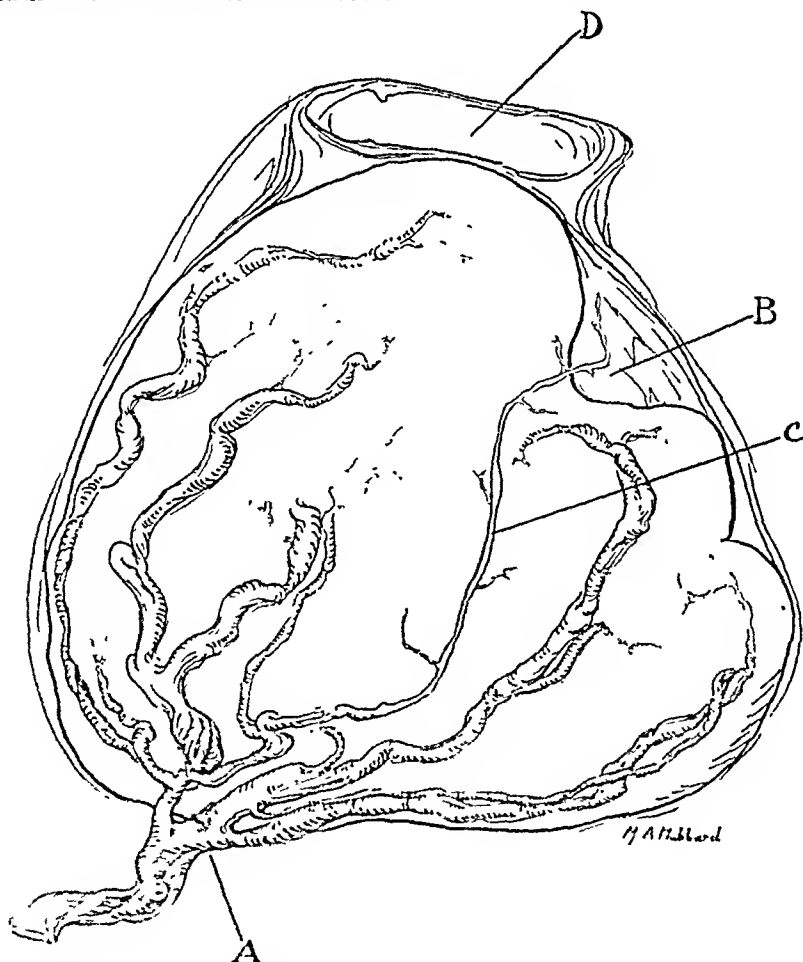


Fig. 8.—Case No. 911. Asymmetry of cerebral hemispheres. A, cord attached to edge of placenta; B, large white infarct corresponding to bleeding spell six weeks before birth; C, empty blood vessel; D, opening in membranes on edge of placenta.

placenta showed an area of damage at the base of the cord. It will be noted in the drawing that the opening in the membranes was on the edge of the placenta and probably this accounts for the repeated bleeding spells in June, July and November. There was also a white infarct on the maternal surface near the base of the cord. (Fig. 6.)

CASE 013. Multipara. Reported by the courtesy of Drs. Melick and Herrick. No history available in this case except that the patient had had a blood pressure of 140 for over two years previous to her present pregnancy. The baby was anenceph-

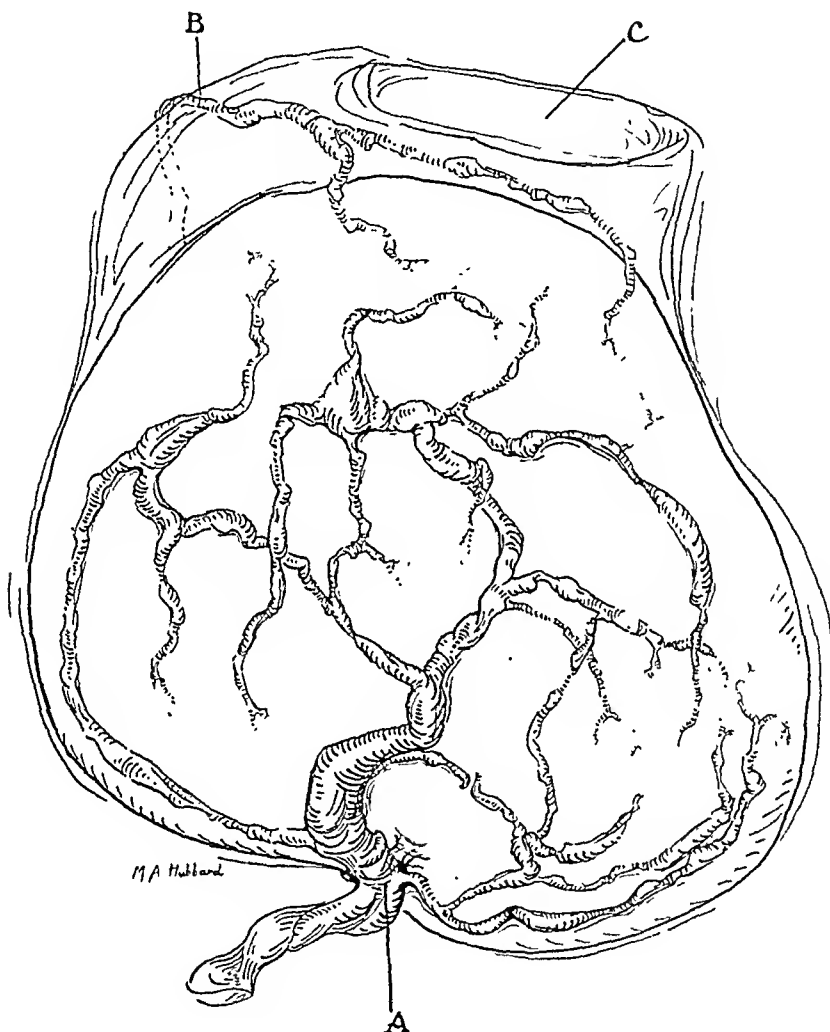


Fig. 9.—Case No. 591. Deformity of both hands and duodenum. A, cord attached to edge of placenta; B, blood vessel which traversed the membranes opposite to the placenta until it reached placental tissue; C, opening in membranes near edge of placenta.

alic and stillborn at seven months. The placenta showed the cord attached near the edge with damaged placental tissue between the cord and the near edge. (Fig. 7.)

CASE 014. Primipara, age twenty-five. Last period June 8, 1922. In August she had an infected painful tooth treated. She flowed a little Oct. 15, also for two days following Jan. 5. Teeth: four crowns, one pivot tooth, two retained roots with pyorrhea. Tonsils, small. There was bleeding during labor. Breech delivery on Feb. 28, was complicated by dry uterus and a firm contraction ring. Baby was stillborn. The left side of the head was larger than the right. Autopsy was done,

and although no other deformities were found, the left hemisphere after removal from the skull was definitely larger than the right. The cord had almost a velamentous attachment to the edge of the placenta. Note the opening in the membranes on the edge of the placenta opposite the cord attachment. Also the white infarct which agrees in position to the time of the bleeding on Jan. 5. (Fig. 8.)

CASE 591. Multipara, age thirty-one. First seen at end of seventh month. First pregnancy normal. Second, miscarriage at two months, one and a half years ago. Scarlet fever as a child. She had two crowns, with pyorrhea and two other dead teeth. X-ray examination showed three of these had apical abscess areas. Tonsils deep red and full of deposit. Last period was July 4. She could remember nothing abnormal about the beginning of her pregnancy, except neuralgia in the teeth. Vomited through the fifth month. Membranes ruptured on Mar. 17 with the escape of an excessive amount of fluid. Normal delivery followed. The thumb and first two fingers were absent on the right hand and there was a rudimentary thumb on

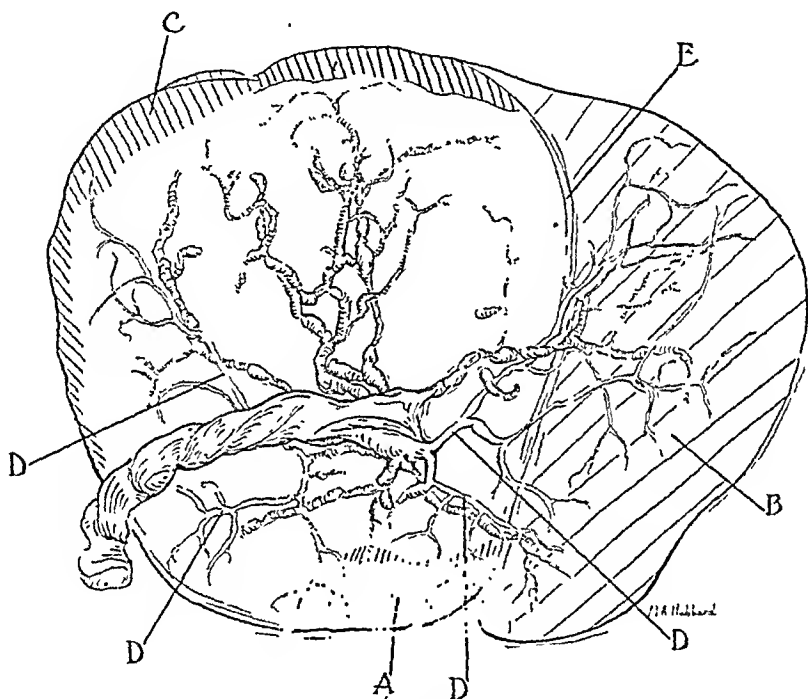


Fig. 10.—Case No. 611. Lumbar spina bifida. A, large white infarct; B, shaded area represents very thin placental tissue, much infarcted; C, infarcted edge of placenta; D, empty blood vessels; E, margin of normal placental tissue.

the left hand. Both hands were in acute flexion on the wrists. The baby died on the third day with symptoms of internal hemorrhagic disease. No meconium passed. Autopsy showed that the duodenum was much distended and did not connect with the jejunum. There was also evidence of hemorrhagic disease. The placenta had the cord attached to the edge and the tissue under the base of the cord was thin and firm. Note also the opening in the membranes on the edge of the placenta opposite to the cord attachment. (Fig. 9.)

CASE 603. Multipara. First pregnancy; Baby died, hemorrhagic disease; Second pregnancy, a miscarriage; Third pregnancy, normal.

Between the third and fourth pregnancies the patient had been troubled with sore throat. The left tonsil was full of retained deposit. Last period was July 10, 1922. On April 15, 1923 she had a normal breech delivery. The placenta showed the cord attached to the edge. The baby seemed normal. The patient was asked whether she could remember any colds in the early part of her pregnancy and

reported that her last period was July 10 and on the 29 she had a severe cold. On the third day of the puerperium the nurse reported that the baby had an abdominal hernia. The ring of the hernia was found about one inch above the umbilicus and in the median line, and about the size of a lead pencil. The hernia was still present but not increasing in size when the child was three months old. In this case the evidence was obtained in the reverse order. In asking the patient for evidence of acute infection early in pregnancy, I was searching for evidence to account for the position of the cord attachment on the placenta. The small congenital defect in the baby was not discovered until the other evidence had been obtained.

CASE 611. Primipara, measles, scarlet fever, severe chicken pox, influenza 1918, tonsillectomy, 1917. Has been subject to neuralgia of the back of the neck and right arm since tonsillectomy. Has two dead teeth, one of which shows inflamed gums. Last period July 15. Life felt Nov. 23. Delivered May 7 by low forceps of a poorly nourished baby with lumbar spina bifida, very wide fontanelles and sutures and a spastic right leg. Baby died in ten days. Autopsy showed death due to hemorrhagic disease. The pregnancy had been mildly toxic, beginning with excessive vomiting requiring hospital treatment. Blood pressure was 140-95 before delivery, urine negative. There was a small bleeding spell one week before delivery. A sketch of the placenta shows damage to the placental tissue within one and one-half inches of the base of the cord and an infarcted edge on the most distal portion of the placenta. (Fig. 10.) There is no clinical event in this pregnancy other than the severe vomiting which occurred the first week in Sept. or about the time when the damage on the placenta originated.

CASE 015. Multipara, age thirty-one. Past history unessential except that she had been subject to colds. Four previous deliveries were said to be normal.

The last period of her fifth pregnancy occurred Dec. 18, 1922, and she had a normal delivery on Oct. 4, 1923. The head of the baby was deformed. The frontal prominences were depressed with the result that the frontal suture formed a sharp protruding ridge. The eyes were slanting downward and inward.

Her pregnancy had been slightly toxic, vomiting lasting through the sixth month, headaches occurred daily during September and there was moderate edema. On Feb. 1 she went to bed with a severe cold and remained there five days. The placenta showed the cord attached three-fourths of an inch from the edge.

The outstanding feature in these twenty cases is the fact that all the placentas show evidence of damage within a radius of an inch and a half from the base of the cord. The evidence from other cases tends to show that the bleeding spells which occur within the first two months of pregnancy are associated with placentas which have the cord attached one and one-half inches or less from the edge of the placenta. This evidence is also consistent with the size of the placenta at this early stage in pregnancy.

From a clinical standpoint in seven of the cases there is the association of an acute infection in the head (a cold) within the first two months of the pregnancy, four others had a bleeding spell within the first two months of pregnancy, eight of the remaining nine were associated with foci of chronic infection and one case has no history or examination but had a raised blood pressure.

The different types of deformity are as follows: anencephalia, six; hare-lip, absence of right ear, asymmetry of hemispheres, deformity

of frontal bones, deformity of heart with ascites, deformity of esophagus, hernia of abdominal wall, deformity of both hands and duodenum, one each; lumbar spina bifida and congenital valgus, each two; congenital varus and deformity of both feet, one each.

It was my original conception that the deformed baby was the result of direct infection of the embryo through the villous membrane. The work of Stockard⁹ of Cornell, however, shows that direct infection of the embryo is not necessary. He has produced twins, double monsters and deformities in fish by reducing the oxygen supply to the eggs at a crucial time in their development. In view of this work it is more probable that the injury to the placenta and the placental site caused by the beginning infarct (the hemorrhagic lesion with thrombosis above referred to) reduces the total area for oxygen interchanged between the mother's blood and the fetal blood. It is reasonable to assume that such an injury will cause a temporary cyanosis in the embryo. If this accident happens at the time that some part of the embryo is in the process of rapid proliferation or budding, such a part will be inhibited in its growth with the result that a failure of development of that part takes place. Stockard has shown that there are periods of relative rest between these budding processes. It is apparent, therefore, that there may be an injury to the placenta early in the pregnancy but if this injury does not cause sufficient cyanosis in the embryo or does not occur at the time some budding process is active, no damage to the embryo will result. This feature of the situation makes it clear why a placenta with an injury at the base of the cord does not always bring a deformed baby in association with it.

A very interesting case which tends to support Stockard's theory was reported by Dr. Davis of Omaha.¹⁰ In his case of homologous twins, both had identical types of hare-lip. By good fortune he had noted in his report that both cords came from the edge of the placenta. This case shows contemporaneous damage to both embryos and contemporaneous damage near the base of both cords.

The observation which Dr. Greenhill of Chicago¹¹ has recently published, calling attention to the frequent association of deformed babies with placenta previa, contains important confirmatory evidence. In an earlier paper¹² I have endeavored to show that early damage to the placental site may be the determining factor in causing some cases of placenta previa. For example, if the damage to the placental site is on the upper edge, the compensatory growth on the lower edge may reach the cervix even though the ovum had a relatively normal point of implantation in the uterus. Reference to the foregoing cases shows that four of them show this feature. This evidence is therefore in conformity with Dr. Greenhill's observations. The foregoing theory as to the cause of deformed babies shows that the same early

damage to the placental site may be at once the cause of the deformity and the cause of the previa. The reason that there is an increased incidence of deformed babies in association with placenta previa is therefore explained.

Further evidence which is consistent with the foregoing theory as to the origin of deformed babies is to be found in the chapter on the *Pathology of the Human Ovum* in the first volume of *Human Embryology* by Keibel and Mall. In this chapter he submits evidence which conclusively shows that a *normal* ovum may develop any deformity which may result from a lack of development of some part or parts of the embryo. This evidence tends to show that heredity is not always the dominant factor in deformities, if at all. He also states that most deformities have their origin before the end of the eighth week. The following quotations are significant on the question of the presence of inflammation and its site:

“The study of pathologic ova has shown that the embryos within are deformed and that there are structural changes in the chorion which appear to be associated with inflammatory processes *in the uterus*. The villi are usually fibrous or are otherwise degenerated, the syncytium is atrophic or necrotic and there is an excess of blood and mucus rich in leucocytes between the villi. The picture indicates that the chorion is affected *by an inflamed uterus* which naturally interferes with its nutrition.”

The extremely discrete nature of the damage is shown by the following statement and a suggestion of the infectious origin is given.

“The chorion shows all kinds of changes of its syncytium. It is often deficient, irregular, or necrotic or intermixed with leucocytes which may form *small abscesses* in it.” (The italics are mine).

These findings are similar to those found in the two cases above referred to where the placenta was examined *in situ*.

Mall also points out that fully 50 per cent of abortions contain malformed embryos and that 12 monsters abort to every one that goes to full term. In view of the evidence submitted I should interpret this association of abortion with the deformed embryo as being dependent on the death of the deformed embryo or a subsequent damage to the placenta rather than to the fact of the deformity of the embryo alone. By this theory it is plain that the same process which caused the deformity can cause miscarriage if it is repeated and is greater in extent.

CONCLUSIONS

The evidence tends to show that most congenital malformations which are the result of lack of embryonic development are not hereditary defects but acquired *in utero*; that defects in development are due to injury to the placenta during the early weeks of pregnancy; that the injury to the placenta is due to maternal hematogenous in-

fection of the blood vessels of the placental site, and that the source of the hematogenous infection is generally to be found in the teeth or tonsils.

28 PLEASANT STREET.

REFERENCES

- (1) *Talbot, J. E.*: Surg., Gynec. and Obstet., July, 1922, pp. 42 to 49 and August, 1922, pp. 187 to 197. (2) *Dieulafoy, G.*: A Text Book of Medicine. Translated by Collins and Leibmann, 1904, ii. (3) *Williams, J. W.*: Obstet., p. 592. (4) *McNalley, F. P. and Dieckmann, W. J.*: AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, Jan., 1923, v, 55. (5) *Willson, P.*: Surg., Gynec. and Obstet., January, 1922, p. 57. (6) *De Lee, J. B.*: Practical Medical Series, 1921, p. 209. (7) *Cornell, E. L. and Earle, W. C.*: Surg. Gynec. and Obstet., 1919, xxix, 485. (8) *Thompson, W. B.*: Bull. Johns Hopkins, July, 1921, p. 288. (9) *Stockard, C. R.*: Am. Jour. of Anatomy, January, 1921, xxviii, No. 2. (10) *Davis, A. D.*: Surg., Gynec. and Obstet., Nov., 1922, xxxv, No. 5, p. 568. (11) *Greenhill, J. P.*: Surg., Gynec. and Obstet., Feb., 1923, xxxvi, No. 2, p. 227. (12) *Talbot, J. E.*: Surg., Gynec. and Obstet., June, 1921, p. 552-556. In this connection see also W. B. Thompson's case, reference (8) above, and a Case of Intrauterine Rupture of a Velamentous Cord by George W. Kosmak in AM. JOUR. OBST. AND GYNEC., December, 1922, iv, No. 6, p. 619.

END RESULTS OF 201 CASES OF CARCINOMA OF THE CERVIX

BY HOWARD C. TAYLOR, M.D., AND THOMAS C. PEIGHTAL, M.D., NEW YORK CITY

(From the Gynecological Service of the Roosevelt Hospital.)

THE following is a report of 201 consecutive cases of carcinoma of the cervix, admitted to the Gynecological Service of the Roosevelt Hospital, during the period from 1910 to 1920, inclusive,—eleven years. During this time there have been a number of changes in the procedure of handling these cases and, since 1917, radium has been used extensively in the great majority of instances, either alone, or preparatory to and following operative removal. For this reason, a study of the end results is not complete without showing their relation to the type of procedure, and the groups shown in the tables which follow are so arranged as to bring out this relationship.

No attempt will be made to study these cases with reference to symptoms, signs, or other points of interest in their histories, except to give the age of incidence, state in life, and the relation to child-bearing. Likewise, the pathology will be discussed only as to type and location of growth, with special reference to its bearing on the end results, particularly in those cases which show no recurrence, after three years.

Age of Incidence.—The exact age is known in 182 cases, and an analysis by decades shows the following: Two cases between ten and twenty years, one being twelve and the other nineteen years of age; 7 cases between twenty and thirty; 36 cases between thirty and forty; 76 cases between forty and fifty; 53 cases between fifty and sixty; 5

eases between sixty and seventy and three cases over seventy,—these being seventy-one, seventy-two and seventy-five years of age. Thus it will be seen that 90 per cent of the cases fell between thirty and sixty years, and 70 per cent of the cases between forty and sixty years. The average age is forty-five and one-half, the youngest being twelve and the oldest seventy-five years. The age seems to bear little, if any, relationship to recurrence: for the average age of cases free from growth, after three years, is forty-one, which is practically the average age of incidence.

State in Life, and Relation to Child-Bearing.—Of the 201 cases, 192, or 95.5 per cent were married, while 9, or 4.5 per cent were unmarried. Likewise 181 cases, or 94.3 per cent bore one or more children, while 11, or 5.7 per cent were nulliparae. With such a preponderance of these cases falling among the multiparous women, one naturally is forced to the conclusion that child-bearing is a definite causative factor in carcinoma of the cervix; but when one considers that the majority of women at forty-five,—the average cancer age shown above,—are married and have borne one or more children, this conclusion loses some of its importance.

Pathology.—Of the cases included in this report, biopsy with pathologic report, from sections, was obtained in 192, while in 9 cases the diagnosis was only established clinically,—but in each of these latter the disease was so far advanced as to be practically unmistakable, and was grossly of the squamous variety. Of the specimens examined in the laboratory, 9, or 5 per cent proved to be adenocarcinoma, the remainder, 183, or 95 per cent, being squamous in character. All the cases which have shown no recurrence, after three years, were of the squamous group. As to the age and type of growth, the youngest case, 12 years, showed adenocarcinoma, while the ages of the other cases, in this group, all ranged between forty and fifty years.

A study of the location and extent of growth on admission furnishes several points of interest. These facts have been established, in all but the few classed as inoperable, by pelvic and rectal examination under a general anesthetic, and, in the cases where excision was done, by direct observance at operation and subsequent study in the laboratory. In only 48 cases the lesion was confined to the cervix alone; in 40, it had extended into the vaginal walls, while in 103 it was decided that the surrounding parametrial tissues were involved. Of the 16 cases alive over three years without recurrence, 11 showed cervical involvement only; four showed extension to the vaginal walls, and one case beginning extension into the parametrium. Of the cases in which recurrence took place after three years, all but one originally had involvement of cervical tissue only. Thus, in these cases traced, a favorable prognosis depended very materially on whether or not the growth was limited to the cervix.

Type of Procedure.—As stated previously, the type of procedure in handling these cases of carcinoma of the cervix has varied considerably from time to time during the eleven years covered by the report. Before the use of radium cases were divided into two groups,—the operable and the inoperable,—the latter being treated only palliatively, or with chemicals such as acetone. The operable group had either the classical Wertheim type of operation, or a complete hysterectomy, with rather wide excision of the broad ligaments; and both of these were, as a rule, combined with cauterization of the cervix. The latter was accomplished, in some cases by the actual, or hot, cautery, and in others by the Percy method. In an intermediate group of cases excision was not attempted, but the cervix alone was subjected to cauterization by one of the two methods mentioned above.

After the adoption of the use of radium in 1917, a number of cases were still treated by these procedures, but soon thereafter the present-day methods were developed as follows. Extremely early cases are still considered operable and receive radiation with the element both before and after excision. A varying period of from two to six weeks is allowed to elapse between the primary radiation and hysterectomy, and here a modified Wertheim, with exposure of the ureters in their lower course, or a rather wide complete hysterectomy is done. Postoperative radiation in the healed vaginal vault is begun before the patient leaves the hospital, and is continued later, if the original extent of the growth seems to warrant it. The average preoperative application of radium is 2400 milligram-hours within the cervical canal and growth,—while the average postoperative dose is 1000 milligram-hours. The element itself is used in silver and brass capsules,—one 50 and two 25 milligram tubes. At present the inoperable cases are treated by repeated radiation of the growth,—the primary application usually being 2400 milligram-hours;

TABLE I

OPERATION	TOTAL	TOTAL TRACED
Hysterectomy		
Wertheim-cautery	41	21
Wertheim-radium	10	9
Total Wertheim type	51	30
Hysterectomy		
Complete cautery	34	20
Complete radium	12	7
Total complete type	46	27
Total hysterectomies	97	57
Hot cautery alone	17	9
Percy cautery alone	10	8
Radium alone	50	15
Total operations	174	89
Inoperable (previous to 1917)	27	5
Total Cases	201	94

and those following depending upon subsequent examination, and the possibility of vesicovaginal and rectovaginal fistulae.

Table I shows the 201 cases grouped according to the type of operative procedure, as well as the number in each group which could be traced with sufficient accuracy as to be considered of value in establishing end results.

There were 97 hysterectomies, 51 of them Wertheim and 46 complete. Only 30 per cent of the former and 27 per cent of the latter could be traced. Seventeen cases were cauterized with actual or hot cautery only, while on ten the Percy method alone was used. We have been able to follow nine of the former and eight of the latter. Fifty cases received radiation only, of which the outcome is known in fifteen. The remaining 27 were of the inoperable, advanced group, and were seen previous to the use of radium.

End Results.—Of the 201 cases treated, only 94 could be traced, and the end results discussed below are based upon this total.

Operative Cases, with No Recurrence, or Free from Growth Three Years or more After Operation.—Sixteen cases fall into this group and are shown below in Table II. The only cases considered here, as possibilities, are those in which some type of hysterectomy was done; except for one case of Percy cauterization of the cervix and ligation of the internal iliacs, in which there was no evidence of growth four years after operation. This case has not been traced since 1920, and all attempts to locate it have been unsuccessful.

TABLE II
CASES WITH NO RECURRENCE IN RELATION TO OPERATIVE PROCEDURE

OPERATION	TOTAL TRACED	3 YEARS	4 YEARS	5 YEARS	6 YEARS	7 YEARS	8 YEARS	9 YEARS	TOTAL
Wertheim-cautery	21	1	1	1			1	1	5
Wertheim-radium	9			2	1				3
Total Wertheim	30	1	1	3	1		1	1	8
Complete cautery	20			1			1	1	3
Complete radium	7	1	1	1		1			4
Total complete	27	1	1	2		1	1	1	7
Total hysterectomies	57	2	2	5	1	1	2	2	15
*Percy cautery alone	8		1						1
Total	65	2	3	5	1	1	2	2	16
Percentage (Excision cases)	57	4.5	4.5	11.4	2.3	2.3	4.5	4.5	34.0

*This case had ligation of internal iliacs also.

Note: As 13 of these cases died postoperatively, percentages are figured on total of 44.

It will be seen that 2 cases have gone between three and four years without recurrence; 3 cases between four and five years; 5 cases between five and six years; 1 case between six and seven years; 1 between seven and eight years; 2 between eight and nine years, and 2 between nine and ten years. Eleven, or more than two-thirds, of these cases are

over five years. Thus, of the 57 cases traced, which had some type of hysterectomy, 15 are known to be alive without recurrence more than three years, or a total of 34 per cent for successful results in the operative cases. A correction of percentage is necessarily made as 13 of this group died postoperatively in the hospital.

The table also shows the type of operative procedure, and here the results indicate practically as much success, where complete hysterectomy was chosen, as where the more extensive Wertheim was done. If any operative group can be said to have shown more success than the others, it was where one of the two types of hysterectomy was combined with radiation. This fact would seem to justify the present method of treatment described above for operative cases, that is, wide complete hysterectomy, with preoperative and postoperative radiation.

Operative Cases with Known Recurrence.—Here again only cases in which some form of hysterectomy was done are considered, and they are summarized in Table III.

TABLE III
SHOWING TIME OF RECURRENCE IN RELATION TO OPERATIVE PROCEDURE

OPERATION	TOTAL TRACED	6 MONTHS	1 YEAR	18 MONTHS	2 YEARS	3 YEARS	4 YEARS	5 YEARS	TOTAL
Wertheim-cautery	21	3	2		1	3	1		10
Wertheim-radium	9	2	2		2				6
Total Wertheim	30	5	4	0	3	3	1	0	16
Complete cautery	20	3	3	1			1	2	10
Complete radium	7	1		1		1			3
Total complete	27	4	3	2	0	1	1	2	13
Total hysterectomies	57	9	7	2	3	4	2	2	29
Percentages of total	44.	20.5	15.9	4.5	6.8	9.1	4.5	4.5	65.9
Percentages of re- currences		31.0	24.0	7.0	10.0	14.0	7.0	7.0	

Note: Recurred in 3 years, 25 (85 per cent); over 3 years 4 (14 per cent). Percentages are figured on a total of 44.

All these showed recurrence within the pelvis,—the majority in the remaining parametrial tissues; a few locally in the vaginal walls, and only one to some distant organ,—in this case to the parotid gland. Nine cases had recurrence in six months, seven more in twelve months, two more in eighteen months, three between eighteen months and 2 years; four more in three years; two more in four years, and two more in five years. Thus, of the 57 operative cases traced, 29, or 66 per cent are known to have had recurrence, and of these 55 per cent recurred within one year, 86 per cent within three years, 14 per cent between three and five years, and no cases going over five years have shown recurrence to date.

This table also shows the type of operation in relation to time of recurrence,—but little if any conclusion can be drawn from this compari-

son. Sixteen cases had had Wertheim and thirteen complete hysterectomy. Up to three years, fifteen of the former and ten of the latter had shown recurrence, while after three years one Wertheim and three complete hysterectomies developed further lesions. Comparison of these figures with the total cases traced for each operative group, shows approximately a 50 per cent recurrence in each.

Deaths.—Table IV gives a statistical study of all deaths, showing the relation between the time of death and the type of treatment, whether excision, cautery or radium alone.

TABLE IV
SHOWING TIME OF DEATH IN RELATION TO OPERATIVE PROCEDURE

OPERATION	TOTAL TRACED	P.O.	6 MOS.	1 YR.	18 MOS.	2 YRS.	3 YRS.	4 YRS.	6 YRS.	TOTAL
Wertheim-cautery	21	6	3	2			2	2	1	10
Wertheim-radium	9		1	2	1		1		1	6
Total Wertheim	30	6	4	4	1	0	3	2	2	16
Complete cautery	20	7	2	1	2	1		2	1	9
Complete radium	7			1		1	1			3
Total complete	27	7	2	2	2	2	1	2	1	12
Total hysterectomies	57	13	6	6	3	2	4	4	3	28
Percentages	44	13.3	13.6	13.6	6.8	4.5	9.0	9.0	6.8	63.6
Hot cautery alone	9		4	1	1	2		1		9
Percy " "	8		4	2		1				7
Total cautery	17		8	3	1	3	0	1	0	16
Radium alone	15		6	2	2	2	2	0	0	14
Total	89	13	20	11	6	7	6	5	3	58
Percentages	76	7.5	26.3	14.5	7.9	9.2	7.9	6.6	3.9	76.3

Note: Of the 27 inoperable cases treated palliatively, only 5 could be traced, and all died within 6 months.

Of the 57 cases which had hysterectomy, thirteen died postoperatively in the hospital and are analyzed as a special group below; six died within 6 months, six more within a year, five more in two years, eight more in four years, and three more in six years. The last three had shown recurrence in two, three and five years, respectively, but life was prolonged until the sixth year in each case by radiation. Thus of the 57 cases mentioned above 44 left the hospital, and of these 28, or 63 per cent died of cancer within six years,—21 or 75 per cent of the deaths occurring within three years. One additional case, free from growth four years after operation, died of pneumonia. One other patient, developing recurrence five years after excision, is still living two years after the recurrence was noted, but is in very poor health. Of the cases leaving the hospital, approximately just as many died of cancer following Wertheim as following complete hysterectomy.

Seventeen cases were traced which had been treated with the hot and

Percy cautery. Of these all but one were dead within three years, and 70 per cent of these deaths occurred within one year.

Only fifteen cases treated by radium alone could be traced, and of these fourteen were dead within three years,—60 per cent of these deaths occurring within the first year. The remaining case is still alive, three years after first radiation, but the growth is well advanced and the patient has a rectovaginal fistula.

Of the twenty-seven advanced inoperable cases that received nothing but palliative treatment, only five could be traced, and all of these died within six months.

Thus a summarization shows a grand total of 76 (or 80 per cent) deaths due to cancer, out of the 94 cases traced.

Postoperative Deaths.—An analysis of the thirteen cases dying in the hospital, after operation, follows:

From 1911 to 1920, there were 97 hysterectomies, 51 of Wertheim and 46 of the complete type. Thirteen of these cases, or 13.3 per cent, died postoperatively in the hospital. All of these deaths occurred between 1911 and 1915, during which period 64 of the hysterectomies were done. From 1916 to the end of 1920, 33 cases had hysterectomy (17 Wertheim and 16 complete) but in none of these did death result from operation. Of the seventeen cases treated by the hot cautery and ten by Percy cautery, none have died in the hospital. Likewise, there have been no fatal results from treatment by radium, either alone or combined with hysterectomy, there having been fifty of the former and twenty of the latter, in the period covered by the report. Thus, of the 174 cases having some type of operative procedure, in 13 only (or 7.5 per cent) can it be said that death resulted from operation.

In these postoperative deaths, the average age of the patient was forty-eight. One case died on the table, and six others died within seventy-two hours; two died from pneumonia (one on the fourth and the other on the fourteenth day); one death on the eighth day was due to ileus; and in three other cases (one on the eighth, one on the eleventh and one on the eighteenth day) death resulted from circulatory com-

TABLE V
SHOWING RELATION OF DEATH TO RECURRENCE

RECURRENCE IN	TOTAL	DIED AFTER RECURRENCE IN					
		6 MONTHS	1 YEAR	18 MONTHS	2 YEARS	3 YEARS	4 YEARS
6 months	9	6	1	2			
1 year	7	5	1			1	
18 months	2	1	1				
2 years	3		2				1
3 years	4	2	1			1	
4 years	2	2					
5 years	2		1		(1-alive)		
Total	29	16	7	2	1	2	1

plication. Six had had Wertheim and seven the complete type of operation. In four the growth was confined to the cervix; in three the vaginal walls were also involved, while in six there was beginning extension to the parametrium. .

Relation of Death to Recurrence.—In Table V, the relation of time of death to recurrence is shown. Of the 29 cases, showing recurrence at various periods from six months to five years, 16, or 55 per cent, were dead six months later, while 7, or 24 per cent lived only one year, making a total of 23, or 79 per cent, who died within twelve months. Thus the length of time between operation and recurrence has no relation to, or effect upon, the time of death after recurrence; as the cases where carcinoma reappeared three, four and five years after operation, died just as soon as those in which the postoperative free interval was of much shorter duration. Two patients died three years, and one four years after recurrence, while one is still alive, four years after the growth reappeared. But all four of these cases have been extensively radiated,—this accounting in some measure for the prolongation of life.

Radium Cases.—Since 1917, seventy-two cases have been treated by radiation, either alone or combined with some type of excision. Fifty cases, having been considered inoperable, have had radium only, while twenty-two were radiated in conjunction with hysterectomy. Wertheim was done in ten, and complete hysterectomy in twelve of these twenty-two cases. Eight of them received radiation before, four after, and ten before and after operation. The average amount before was 2000 milligram-hours, and the average postoperative application was 1000 milligram-hours. In the group of fifty cases treated by radium alone, the smallest total amount used was 1200 milligram-hours (this case failing to return for further treatment), while the largest amount was 7200 milligram-hours, in four applications. The average total application was 4000 milligram-hours.

Of the twenty-two operative-radium cases only sixteen could be traced. Of these seven, or 44 per cent have remained without recurrence—one three years, one four years, three five years, one six years, and one seven years. The remaining nine, or 56 per cent have all developed recurrence,—three in six months, two in one year, one in eighteen months, two in two years, and one in three years. Of these nine, all are dead,—six dying within six months, two within twelve months, and one, four years after the recurrence.

The latter case is of particular interest. Six years ago the patient had a Wertheim hysterectomy, with 2400 mghr. radiation before, and 600 mghr. after operation. Two years later recurrence developed as a small nodule in the anterior vaginal wall near the urethra. In the past four years since its reappearance the growth has been radiated three times for an additional 2150 mghr., the last application having been about one year ago. Within the past six months an indurated, ulcerated area

developed on the anterior vaginal wall, and metastatic masses have been noted within the pelvis. The patient's death has been reported within the past few weeks. Undoubtedly radiation very materially prolonged life in this case.

Of the fifty cases of advanced carcinoma of the cervix treated with radium alone, unfortunately only fifteen have been traced. This is due to the fact that the majority of them were treated during the recent war period (from 1917 to 1919), when the follow-up system was greatly handicapped by a limited personnel, and by the frequent change in the patient's address.

Fourteen, or 90 per cent of those traced have died of cancer, six within six months; two more within a year; two more in eighteen months; two more within two years, and two others lived three years. The remaining one, while still alive three years after the first radiation, is in fair health, but has a rectovaginal fistula, and the growth is well out into the parametrial tissues. This case has had 5200 mghr. radiation, in four applications. Two others had fistulae,—one rectovaginal and one vesicovaginal.

Thus 60 per cent of these advanced cases died within twelve months, and of the others only one had lived more than three years. All showed marked regression of the growth locally within the cervix and vaginal walls, the majority shrinking down so that their offensive discharge and bleeding were completely controlled. In many the lower parametrial involvement also showed some recession, and their general health was materially benefited for a time. Further spread of the growth outward, usually marked by deep pelvic and sciatic pains, could only temporarily be controlled, for at this stage additional radiation was usually limited by the danger of vesicovaginal and rectovaginal fistula. At present these cases are also receiving cross-fire x-radiation of the pelvis, in addition to radiation within the cervix, so that future reports will undoubtedly show even better control of the parametrial involvement.

SUMMARIES

Total number of cases	201	
Inoperable palliative	27	
Total operative cases	174	
Total hysterectomies (Wertheim 51)	97	
Total cautery cases	27	
Total radium cases	50	
Total cases traced (Inoperable-5)	94	
No recurrence or free from growth	16	34%
Recurrence, but not dead	1	2%
Died, postoperative	13	7%
Recurrence, and dead	28	63%
Recurrence in less than three years	25	57%
Recurrence after three years	4	9%
Alive three years, without hysterectomy	2	6%
(Radium cases—1; Cautery, 1.)		
Dead, without hysterectomy	30	94%
Total dead in less than three years,	68	72%
Total dead after three years	8	9%

In the past three years, 1921 to 1923, an additional group of 46 cases of carcinoma of the cervix have been treated. Thirty-one were of the advanced type and had radium alone, while fifteen were considered sufficiently early to have hysterectomy after radiation. These end results are not included in this report, as the usual three year period has not elapsed, but the percentage of those free from growth to date is most promising, and should be even higher than the figures given above for the preceding ten years.

CONCLUSIONS

1. *Advanced Cases.*—This group, when treated by radium alone shows much better results than were formerly obtained by any other nonoperative palliative procedure, or by such operative measures as the use of the actual or Percy cautery. The growth locally in the cervix and vaginal walls can be controlled, so that the patient is infinitely more comfortable than formerly: and the parametrial involvement can for a long period be held in abeyance,—especially if radiation is combined with external x-radiation. Treatment with radium in such cases is a safe procedure: for in none of the 81 cases radiated in the past seven years, has death resulted from its use.

2. *Early Cases.*—This group, when subjected to hysterectomy, shows 34 per cent free from growth three years or more after operation; 25 per cent free five years or more; and where hysterectomy was accompanied by radiation 44 per cent had no recurrence three years or more, and 31 per cent five years or more after the removal. These results compare very favorably with the figures reported by those clinics where radium is available in large amounts, and radiation alone is the adopted method of treatment. Thus, where radium can be used in limited amounts only,—such as 100 milligrams of the element,—and the method of application must necessarily be limited also, hysterectomy plus radiation is still the method of choice in early cases. Here too the safety of such procedure, from the standpoint of postoperative mortality must be emphasized. None of the thirty-seven cases of hysterectomy combined with radiation, have died as a result of operation.

As x-radiation will also be included hereafter in the operative procedure of this group, future end results should show an even higher percentage of five year cures.

THE PHENOLTETRACHLORPHTHALEIN TEST OF LIVER FUNCTION IN THE TOXEMIAS OF PREGNANCY

BY JUDSON A. SMITH, M.D., BOSTON, MASS.

(*Resident Obstetrician, Boston Lying-in Hospital.*)

(*From the Department of Obstetrics of Harvard Medical School.*)

THE work of Abel and Rowntree¹ in 1909, and that of Whipple, Mason and Peightal² in 1913, showed that phenoltetrachlorphtalein is nontoxic and that when it is injected intravenously it is removed from the blood entirely by the liver and is excreted in the bile. The possibility of using its rate of excretion as a measure of liver function was investigated by a number of workers, the method at first used consisting in determining the proportion of the injected dye which could be recovered in the stools.^{3, 4, 5, 6, 7} Later, attempts were made to use the amount recoverable in the bile or the time required for the appearance of the dye in the bile, the bile being obtained by means of a duodenal tube.^{8, 9, 10, 11, 12} While these methods were not entirely satisfactory and did not result in general adoption of the test, yet almost all of these investigators found that in cases of marked liver damage the dye was retained and most of them felt that the test gave some indication of liver function.

In 1922 Rosenthal^{13, 14, 15} modified the test by injecting intravenously a dose proportional to the body weight and determining, instead of the amount of dye excreted in the bile or stools, the amount remaining in the blood serum. With this method he showed that the necrosis of the liver produced in dogs by chloroform or phosphorus poisoning resulted in a marked delay in the excretion of the dye. He then applied the test to ten physically normal patients and ten patients with extra-hepatic disease, using a dose of five milligrams per kilogram of body weight. The rate of excretion was found to be rapid and fairly constant, all of the dye being removed from the blood in from 40 to 60 minutes. About fifteen cases of hepatic disease were then studied and showed various degrees of retention of the dye. In four cases which showed marked retention of the dye the presence of gross liver damage was proved, in one at operation, in three at autopsy. (Three cases of carcinoma, one of acute yellow atrophy).

Such a test of liver function is, of course open, at once to a fundamental and serious objection; namely, that at best it measures only the ability of the liver at the moment to remove phenoltetrachlorphtalein from the blood, and its value must be based on an assumption that the normal function of the liver runs parallel to its capacity to perform

this unusual task. This objection seems even more serious when we consider that the liver has at least four known distinct functions and undoubtedly plays a very complicated rôle in metabolism. Obviously the test will have to be tried on a large series of cases and in a great variety of conditions before we can be sure of its interpretation. However, should it eventually be found that the retention of the dye is reasonably good evidence of liver damage, the test might be of value in detecting early the necrosis of the liver which occurs in the toxemias of pregnancy. Rosenfield and Schneiders¹⁶ have already reported a series of tests in toxemias of pregnancy, showing that in some cases there was a definite retention of the dye. I have used the test now on 20 normal pregnant women and 44 patients with toxemia.

TECHNIC

The method employed is essentially that described by Rosenthal.¹⁵ The patient is given intravenously approximately 5 milligrams of phenoltetrachlorphthalein for every kilogram of body weight. The dye used is that furnished by Hynson, Westcott, and Dunning in ampules holding a little more than 2 c.c. This solution contains 50 milligrams of phenoltetrachlorphthalein per c.c. The dye is measured in a 30 c.c. Luer syringe and diluted in the syringe with 2 to 4 volumes of normal salt solution. It is injected into an arm vein through a system of tubing and a three-way stop cock arranged so that the syringe and tubing may be rinsed into the vein with normal salt solution drawn from a flask. (See Figure 1.) Fifteen minutes, one hour, and two hours after the injection from 5 c.c. to 8 c.c. of blood is withdrawn from the opposite arm, to avoid any possibility of contaminating the samples with dye from the tissues. Care is taken always to use for taking samples a needle which has not been used for injecting dye, since the dye is easily decolorized and needles may be contaminated with dye and the fact escape notice. The samples are allowed to stand one to two hours until the serum has separated and are then centrifuged at high speed. The resulting serum should show no trace of hemoglobin. The use of anti-coagulants and determination of the dye in the plasma saves time but results occasionally in slight hemolysis which makes it impossible to determine accurately the amount of dye present.

The amount of dye in these samples is determined by adding alkali and comparing the resulting color with standard solutions. A dose of 5 milligrams per kilogram of body weight would produce, provided none of the dye were removed, a concentration in the blood of approximately 10 milligrams per 100 c.c.¹⁵ A 100 per cent solution is therefore prepared by diluting 1 c.c. (50 mg.) of phenoltetrachlorphthalein to 500 c.c. From this solution dilutions are prepared representing 2 per cent, 4 per cent, 6 per cent, etc., up to 24 per cent, sodium hydroxide being added to the higher dilutions to insure maintenance of the color. These dilutions are sealed in small test tubes and have been kept for four months without appreciable variation. In determining the amount of dye present 0.2 c.c. of 5 per cent sodium hydroxide is added to 0.8 c.c. of the serum to be tested in a small test tube and the resulting color matched with the standards. To get similar colors a tube of unalkalinized serum is placed behind the tube of standard solution and a tube of clear water behind the unknown. I have found that the comparison is better made by artificial light. Above 4 per cent a difference of 2 per cent is very readily appreciated. Below 4 per cent comparisons are not so satisfactory. Below 2 per cent the readings have been recorded either as a trace or a very slight

trace. A trace has been arbitrarily charted at 1 per cent and a very slight trace at 0.5 per cent.

Using this method I have now done the test 100 times on 69 patients. Two patients had moderately severe chills following the injection but there were no other general reactions. Thrombosis of the injected vein was fairly frequent but discomfort from this was unusual. Only once did a patient object to a repetition of the test.

NORMAL CONTROLS

The test was done on 20 clinically normal pregnant women who were just starting in labor, were at term but not in labor, or were in the last month of their pregnancy. None of these patients subsequently showed any evidence of a toxemia.

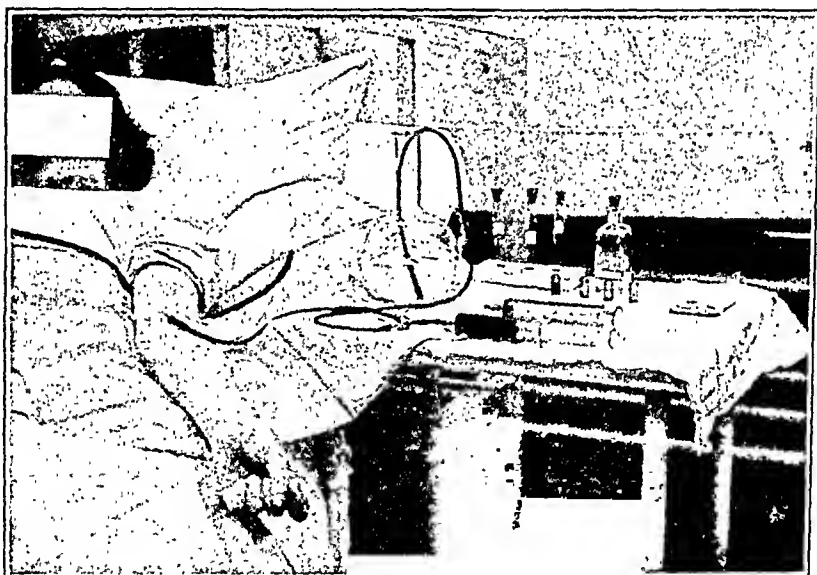


Fig. 1.—Photograph of patient being given the dye.

Fig. 2 shows all the varieties of curves found in these control cases. At the end of 15 minutes the amount of phenoltetrachlorphthalein in the blood varied from a trace to 7 per cent, but was usually between 3 per cent and 6 per cent. Only four cases showed more than a trace at the end of an hour, and only one case showed any dye present at the end of two hours, and then only a very slight trace. Of the four patients who showed from 3 per cent to 5 per cent at the end of an hour all have been delivered and none showed any evidence of toxemia. On one of the patients whose blood showed 5 per cent of dye at the end of 15 minutes, and the same amount at the end of an hour, the test was repeated a few weeks after delivery. Her blood then showed 5 per cent at the end of 15 minutes but only a very slight trace at the end of an hour. In all of Rosenthal's controls the dye was practically entirely gone in 40 to 60 minutes. It would seem therefore that occasional

slight degrees of retention are to be expected in clinically normal pregnant women as compared with normal nonpregnant patients.

Fig. 3 shows a composite curve of the normal controls and may be regarded as the typical normal curve of excretion. The dotted line in Fig. 3 represents what I have chosen to regard as the upper limit of normal retention of the dye.

THE TEST IN PATIENTS WITH TOXEMIA

The test has been used in forty-four patients. Cases of eclampsia have been included with these cases of toxemia, and no attempt will be

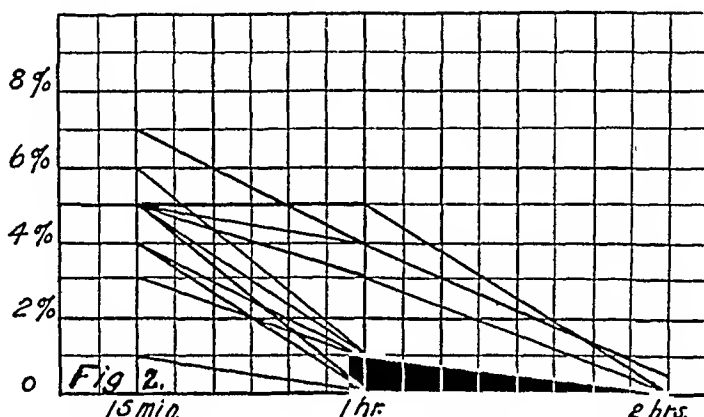


Fig. 2.—Varieties of curves obtained in 20 normal pregnant cases.

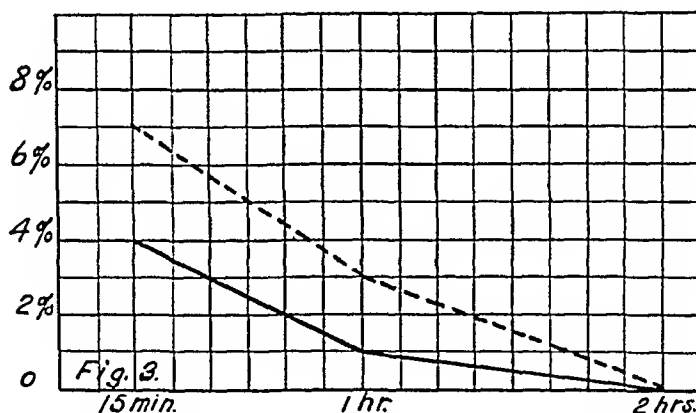


Fig. 3.—The heavy line represents a composite of the curves obtained in 20 normal pregnant cases. The dotted line represents the limit of normal.

made to distinguish here between the so-called nephritic and the pre-eclamptic types of toxemia, since with the data at hand this differentiation seems too uncertain. Cases of definite chronic nephritis are also included in the group but where chronic nephritis has been diagnosed or suspected the fact is noted.

Fig. 4 shows the variety of curves obtained in 10 patients, all of whom had a systolic blood pressure of 160 or higher and showed some degree of albuminuria. Curves 5, 1 and 21 are well within normal limits. Curve 17 is on the border line. Of the other distinctly abnormal curves

there are two types, one, e. g., Curve 24, which shows a rapid drop in the percentage of dye in the blood, but percentages which are well above normal for the time that has elapsed since the injection; and another, e. g., Curve 38, which shows retention of a small but nearly constant amount of dye for the whole two-hour period. The latter type probably should be considered abnormal, even though the dye remains at as low a level as 5 per cent or 6 per cent because in every such case in which it has been possible to repeat the test after delivery, a curve has been obtained similar to the normal one illustrated in Fig. 3. Curve 2 (Fig. 4) illustrates the result of the test in a severe eclamptic a few hours before death. The apparent increase of dye found in the blood

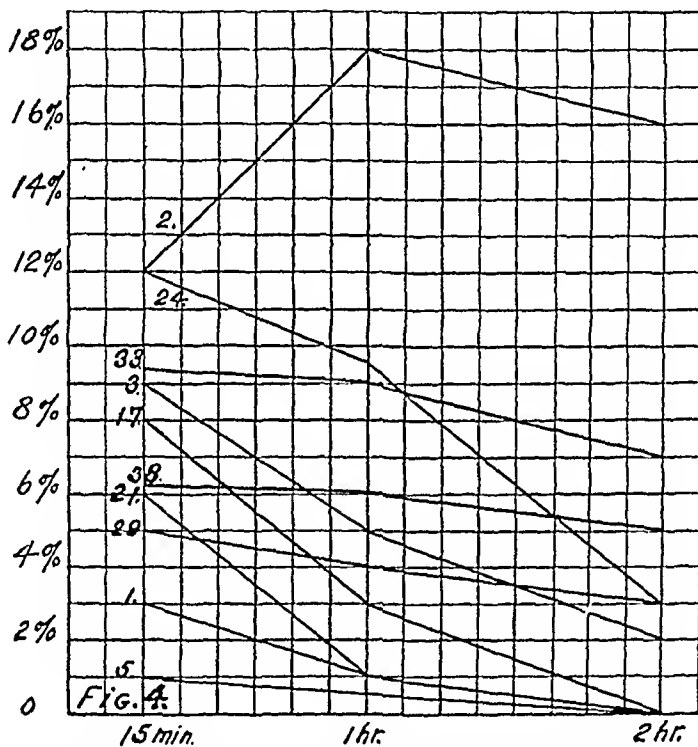


FIG. 4.—Varieties of curves obtained in ten cases of toxemia of pregnancy. All showed marked hypertension and some degree of albuminuria. Numbers refer to cases.

at the end of an hour was observed by Rosenthal¹⁵ in cases with very marked retention. An adequate explanation is not readily suggested.

In the treatment of these forty-four patients no attention was paid to the result of the liver function test. Therefore, in order to bring out any possible significance of the test I have divided the cases into two groups according to whether the test was or was not abnormal. Of the 44 patients 24 had normal tests and 20 had abnormal tests.

Table I is composed of the cases whose liver function tests were normal. (Cases 17 and 40 should perhaps be considered as showing slightly abnormal retention of the dye.) Of these 24 cases, 18 had blood pressures above 165, the other 6 had blood pressures between 140 and 165. About half of them show a trace or a large trace of albumen in the

TABLE I
CASES SHOWING A NORMAL LIVER FUNCTION TEST. LABOR OCCURRED SPONTANEOUSLY UNLESS OTHERWISE STATED

CASE	GRAVIDA	MONTH	SYSTOLIC BLOOD PRESSURE	URINE* ALBUMIN	SYMPTOMS	PERCENTAGE OF DYE IN THE SERUM AFTER 15 MIN. 1 HR. 2 HRS.			TIME OF TEST WITH REFERENCE TO DELIVERY†	DELIVERY	RESULT
1	I	7th	185	L.T.	Severe headache and blurring of vision	3	Trace	0	1-day before	Voorhees' bag. Normal delivery	Well
4	II	3rd 8th 9th	150 150-180 180	s.t. s.t. s.t.	Headache Headache Headache	3 3 3	Trace Trace Trace	0 0 0	6 months before 7 weeks before 1-day before	Abdominal cesarean section (not in labor)	Obstetrically well Chronic nephritis
5	I	Term	180-190	s.p.t.	None	1	Trace	0	3 days before	Low forceps	Well
8	III	7th	170	L.T.	Headache, stupor, edema, one convulsion	4	3	2	4 days before	Voorhees' bag. Normal delivery	Well
9	I	8th	150-160	T.	None	7	3	0	37 days before	Normal	Well
12	II	7th Term	170 160-170	s.p.t. s.t.	None None	3 3	0 Trace	0 0	47 days before 1-day before	Normal	Well
13	VI	6th	180	v.s.t.	Edema. No other symptoms	5	0	0	40 days before	Miscarried macerated fetus in 7th month	Obstetrically well Chronic nephritis
15	I	8th	170-180	s.t.	Occasional slight headache	5 5	2 Trace	0 0	10 days before 1-day before	Voorhees' bag. Normal delivery	Well
16	V	4th	200	s.p.t.	Headache, blurring of vision, vomiting	5	Trace	0	1 day before	Delivered herself of hydramniotic mole	Obstetrically well Probable chronic nephritis
17	I	8th	170-180	T.	Severe headache	(a)8 (b)5	3 2	0 -	12 days before 14 weeks after dcl.	Low forceps	Well

*In this column, s.p.t. means slightest possible trace; v.s.t., very slight trace; s.t., slight trace; T, trace; L.T., large trace.

†In this column 1- means less than 24 hours.

TABLE I—CONT'D

CASE	GRAVIDA	MONTH	SYSTOLIC BLOOD PRESSURE	URINE* ALBUMIN	SYMPTOMS	PERCENTAGE OF DYE IN THE SERUM AFTER 15 MIN. 1 HR. 2 HRS.	TIME OF TEST WITH REFERENCE TO DELIVERY†	DELIVERY	RESULT
18	IV	8th	170	s.t.	Epigastric pain. No other symptoms	7	0	Voorhees' bag. Normal delivery	Well
19	VIII	Term	180	s.p.t.	Headache, blurring of vision	5	Trace	Normal	Obstetrically well chronic nephritis
21	I	3th	220	s.t.	Headache, edema, blurring of vision.	6	Trace	Miscarried	Obstetrically well Chronic nephritis
23	I	9th	140	T.	None	4	Trace	Normal. Twins.	Well
25	II	7th	180	0	None	2	0	Premature labor Normal	Well
28	I	Term	130-200	L.T.	Convulsions 12 hrs. after delivery	4	2	Normal	Well
31	III	Near term	210	T.	Headache, slight edema	7	Trace	Voorhees' bag. Normal delivery.	Well
35	I	Term	165	s.t.	None	6	Trace	Normal	Well

*In this column, s.p.t. means slightest possible trace; v.s.t., very slight trace; s.t., slight trace; T, trace; L.T., large trace.
†In this column 1— means less than 24 hours.

TABLE I—CONT'D

CASE	GRAVIDA	MONTH	SYSTOLIC BLOOD PRESSURE	URINE* ALBUMIN	SYMPTOMS	PERCENTAGE OF DYE IN THE SERUM AFTER 15 MIN. 1 HR. 2 HRS.	TIME OF TEST WITH REFERENCE TO DELIVERY†	DELIVERY	RESULT
37	VI	6th	200	L.T.	Epigastric pain. Ono convulsion	6 Trace	1-day before Trace	Vaginal Hysterotomy	Died 24 hrs. after operation. Liver showed microscopically very slight peripheral hemorrhages, and very slight central necrosis.
39	I	8th	150	T.	None	6 3	2 days before Trace	Voorhees' bag. Mid-forceps	Well
40	II	8th	150 155	s.t. s.t.	None Nono	5 8 2	3 weeks before 4 days before Trace	Started in labor. Cesarean section (Previ-ous cesarean)	Well
41	IV	7th	180	T.	Slight headache	6	2 days before Trace	Premature labor. Normal delivery	Obstetrically well. Probable chronic nephritis
42	XVII	6th	200	s.t.	Nono	5 Trace	2 days before Trace	Vaginal hysterotomy	Well
43	II	Term	150	T.	Nono	6 Trace	8 days before Trace	Started in labor. by castor oil. Low forceps. Macerated fetus.	Well

*In this column, s.p.t. means slightest possible trace; v.s.t., very slight trace; s.t., slight trace; T, trace; L.T., large trace.

†In this column 1- means less than 24 hours.

urine, the other half a slight trace or none at all. In nine of these cases pregnancy was terminated, (in 6 by bagging, in 2 by vaginal cesarean section, and in 1 by abdominal cesarean section). Of the other 15 cases, one started in labor prematurely, two, who were nephritics miscarried and, the others started in labor spontaneously at or near term. The time elapsed between the test and delivery varied from less than twenty-four hours to about fifty days.

Two of these cases had convulsions and one of these two died. One (case 28) had five convulsions starting about twelve hours after delivery when her blood pressure was below 150. The liver function test was done about twenty-four hours after delivery (twelve hours after the convulsions had ceased) and it was normal. She recovered. The other (case 37) had one convulsion after she had been bagged and was then delivered by vaginal cesarean section. Twenty-four hours after delivery she died suddenly without having had any further convulsions. A complete autopsy was not obtained so that the exact cause of her death remains somewhat uncertain. A portion of her liver which was examined was normal on macroscopic examination but microscopic sections showed here and there at the periphery of lobules a few minute hemorrhages such as are characteristic of eclampsia, and also a few central necroses with hemorrhage.* In other words there was only very slight liver damage. The other cases recovered following delivery and except for those who had chronic nephritis were discharged well. Six of the eight patients who probably or certainly had chronic nephritis fall into this group with normal liver function tests.

Table II gives the facts in the 20 cases in which the test was abnormal. All but four showed a trace or a large trace of albumen. Headache, blurring of vision and epigastric pain were distinctly more common in this group. Five of the 20 patients had convulsions as compared with two of the 24 in the first group. In 9 cases labor occurred spontaneously, and in 10 pregnancy was terminated. One died undelivered. Six of the 20 patients died. One death was due primarily to streptococcus infection, the other five deaths were due primarily to the toxemia or the combination of toxemia and operative shock.

In four of the fatal cases in this group postmortem examination of the liver was possible. Three of these cases showed more or less marked necrosis of the liver. The fourth (case 44) in which death was due to streptococcus infection showed only a mild toxic degeneration with a very slight amount of central necrosis, although there had been a persistent fairly marked retention of the phenoltetrachlorophthalein.

Fig. 5 shows (a) a composite curve of the retention of dye in the fatal cases, (b) a composite curve of the retention in the 14 cases with

*Pathological examinations in all cases were done by Dept. of Pathology of Harvard Medical School.

TABLE II
CASES WITH DEFINITELY ABNORMAL LIVER FUNCTION TESTS. LABOR OCCURRED SPONTANEOUSLY UNLESS OTHERWISE STATED

CASE	GRAVIDA	MONTH	SYSTOLIC BLOOD PRESSURE	URINE* ALBUMIN	SYMPTOMS	PERCENTAGE OF DYE IN THE SERUM AFTER 15 MIN. 1 HR. 2 HRS.			TIME OF TEST WITH REFERENCE TO DELIVERY†	DELIVERY	RESULT
2	VI	8th	180	L. T.	Admitted in convulsions	9 12	13 18	13 16	1-before del. 6 hours before death	Voorhees' bag. Low forceps	Died 72 hrs. after delivery in coma and jaundiced. Autopsy showed marked hemorrhagic necrosis of liver.
3	XIX	8th	230	L. T.	Severe headache, blurring of vision, moderate edema	9 4	5 0	2 0	1-day before 4 wks. after del.	Voorhees' bag. Version	Well
6	VI	Term	180	T.	Severe headache, vomiting, slight edema	10	9	6	Test done immediately after delivery	Admitted in labor, delivered normally	Well
7	IV	7th	160	L. T.	Epigastric pain (Improved under treatment)	6	6	0	1 month before	Voorhees' bag. Normal delivery	Died about 3 hrs. after delivery apparently in shock. Liver showed peripheral hemorrhagic necrosis. (No complete autopsy)
		8th	188	L. T.	Epigastric pain Vomiting	9	8	Trace	1-day before		
10	I	6th	180	L. T.	Severe headache	5 6	5 2	3 0	2 days before 13 days after	Miscarried	Well
14	I	6th	200-230	T.	Blurring of vision, epigastric pain, slight edema	14	12	12	3 days before	Labor induced with bougie, normal delivery, macerated fetus	Well, ? Chronic nephritis
20	V	Near term	220	L. T.	Very great edema. Headache, blurred vision, stupor. One convulsion	10	10	4	Few hrs. before death	Voorhees' bag.	Died undelivered. No autopsy

*In this column s.p.t. means slightest possible trace; s.t., slight trace; T, trace, and L.T., large trace.

†In this column 1- means less than 24 hours.

TABLE II—CONT'D

CASE	GRAVIDA	MONTH	SYSTOLIC BLOOD PRESSURE	URINE* ALBUMIN	SYMPTOMS	PERCENTAGE OF DYE IN THE SERUM AFTER 15 MIN. 1 HR. 2 HRS.			TIME OF TEST WITH REFERENCE TO DELIVERY†	DELIVERY	RESULT
23	V	Term	180	L. T.	Moderate edema. Headache. No convulsions	9	8	7	1—before	Voorhees' bag. Version and extraction	Died immediately after delivery, presumably chiefly of shock; no autopsy
24	I	Term	150-220	L. T.	Convulsions 4 hours after delivery. No symptoms before except moderate edema	12	9	3	Test done 4 hrs. after delivery when convulsions started 15 days after delivery	Breech extraction	Well
26	II	Term	160	L. T.	Severe headache	5	5	2	1 day before	Normal delivery	Well
29	I	Term	160	T.	Slight edema	5	4	3	1—before	Normal delivery	Well
32	I	Term	240	L. T.	Slight headache. Moderate edema	11	9	5	2 days before	Twins (1) low forceps (2) Version	Well
33	I	9th	160	s. t.	Slight edema	9	9	9	Few hours before 7 days after delivery	Low forceps	Obstetrically well (Cardiac. No heart failure)
34	I	8th	160	L. T.	Marked edema, drowsiness. Marked elevation of N.P.N. Uremia	6	4	7	1—before 2 days after del. 4 wks. after del.	Vaginal hysterotomy	Died about 60 hours after delivery. Autopsy showed extensive liver necrosis and very severe acute tubular nephritis
36	I	8th	150 175 130-150	T. — —	Slight edema No further symptoms	5 12 3	Trace 8 Trace	0 5 0	20 days before 3-4 hrs. after del. 3 days after del.	Voorhees' bag. Low forceps	Well

*In this column s.p.t. means slightest possible trace; s.t., slight trace; T, trace, and L.T., large trace.
†In this column 1— means less than 24 hours.

TABLE II—CONT'D

CASE	GRAVIDA	MONTH	SYSTOLIC BLOOD PRESSURE	URINE* ALBUMIN	SYMPTOMS	PERCENTAGE OF DYE IN THE SERUM AFTER 15 MIN. 1 HR. 2 HRS.			TIME OF TEST WITH REFERENCE TO DELIVERY†	DELIVERY	RESULT
38	X	6th	180	L. T.	Marked edema and blurring of vision. Several convulsions	6	6	5	1—before del. 18 days after del.	Vaginal hysterotomy	Well. Previous toxemias with convulsions. & chronic nephritis
44	I	Term	160-180	s. t.	Slight edema. No other symptoms	11	10	8	2 days before	Voorhees' bag, high forceps.	Died on 9th day after delivery of streptococcus septicaemia. Autopsy showed mild toxic degeneration of liver with very slight central necrosis
46	V	8th	140-155 150 110-130 100-120	s. t. T. v. s. t.	Peritonitis No symptoms No symptoms	14	9	7	8 days after del.	Normal delivery	Well
49	I	9th	140-160	T.	Slight edema No symptoms	8	5	3	1 day before	Delivered by Well cesearean section (not in labor)	Well
50	VI	8th	100-110 150 170 110-120	— T. — —	No symptoms No symptoms	2	0	0	18 days after	Ruptured membranes and was given castor oil. Normal delivery	Well

*In this column s.p.t. means slightest possible trace; s.t., slight trace; T, trace, and L.T., large trace.

†In this column 1—means less than 24 hours.

abnormal tests which recovered, and (c) a composite curve of the retention after delivery in 11 of these 14 cases.

DISCUSSION

So far as this group of 44 cases is concerned it is apparent that the cases with marked retention of the dye are the more serious cases and

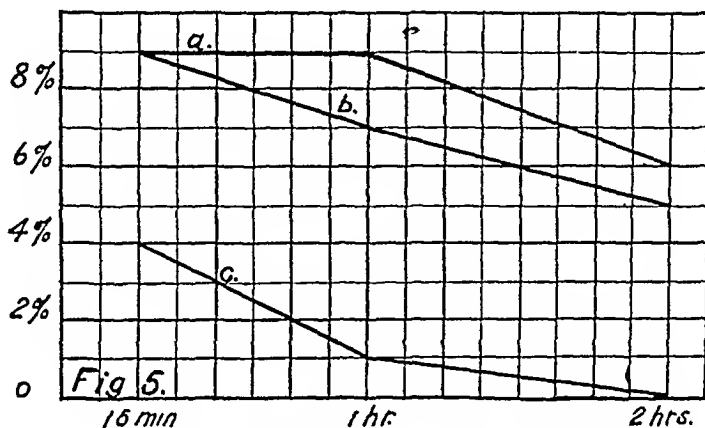


Fig. 5.—(a) Composite of curves in fatal cases; (b) composite of 11 abnormal curves in cases which recovered; (c), composite of curves obtained in 11 of these 14 cases after recovery.



Fig. 6.—Photograph of specimen of liver from Case 2, a typical eclamptic, who showed marked retention of dye. Very extensive necrosis.

have a higher mortality than cases with normal tests. In each of the 4 fatal cases which showed retention of the dye and in which it was possible to examine the liver postmortem, some evidence of liver damage was found, although the degree of retention did not appear to be an

accurate indication of the extent of the actual tissue destruction in the liver.

In Case 2 (see Fig. 4) which showed the greatest retention of any there was very extensive, grossly visible, necrosis of the liver, as is evident in Fig. 6. In Case 34 (Table 2) there was also extensive necrosis of the liver, although the retention of dye was not particularly great. However, death did not occur for two days after the last liver function test was done and it is quite possible for liver necrosis to occur in 48 hours. In Case 44 (Table 2) there was about the same degree of retention eight days after delivery as before delivery, yet at autopsy no more damage to the liver was apparent than would be found in any patient dying of a streptococcus infection. In Case 7 only a portion of the liver could be examined so that the real extent of the necrosis is unknown. In Case 37 (Table I), the one patient with a normal test who died, the liver showed definite slight necrosis, although the liver function test about 36 hours before death had shown no retention of dye. Cases 46 and 50 (Table 2) show that the "liver function" can apparently improve under treatment before delivery.

Such findings on the whole suggest that it is wise not to attach a great deal of importance at present to the result of the test in any given case. The most marked retention occurs in cases which would be recognized as severe toxemias or eclamptics on clinical evidence alone, so that the diagnostic value of the test will depend on whether comparatively slight retentions of the dye early in the course of the toxemia can be relied upon as placing the patient definitely in the pre-eclamptic group. In this connection it should be noted that normal tests will obviously be of no value unless obtained repeatedly at fairly short intervals up to the time labor starts, see e. g., Case 36 (Table 2) which showed a normal curve 20 days before delivery and a distinctly abnormal curve 3 to 4 hours after delivery.

SUMMARY AND CONCLUSIONS

The phenoltetrachlorphtalein test of liver function has been done in 20 normal pregnant women and 44 patients with a toxemia of pregnancy characterized by hypertension and albuminuria (including eight patients who probably had chronic nephritis and seven who had convulsions). The technic used was essentially the same as that described by S. M. Rosenthal¹⁵ and Rosenfield and Schneiders.¹⁶ The amount of dye retained in the blood serum was determined at intervals of 15 minutes, 1 hour and 2 hours after the intravenous injection of the dye.

The average figures for the normal pregnant woman near term are 4 per cent after 15 minutes, a trace (less than 2 per cent) after 1 hour, and none after 2 hours. Occasional slight retention of the dye occurs in clinically normal pregnancies (e. g., 5 per cent after 15 minutes, 5 per cent after 1 hour, 0 after 2 hours). The limit of normal may be

considered 7 per cent after 15 minutes, 3 per cent after 1 hour and a very slight trace after 2 hours.

About one-half of the patients with toxemia showed a definitely abnormal retention of the dye. Marked albuminuria and severe symptoms (including convulsions) were much more frequent in this group and the mortality was much higher than in the group of those with normal tests. Most of the patients who had undoubted chronic nephritis fell into the group with normal tests. Recovery from the toxemia was followed by a return to normal excretion of the dye within two weeks. In a few cases an improvement in the ability to excrete the dye has been observed before delivery.

In all the cases (4) in which the test was abnormal and in which postmortem examination of the liver was possible, some evidence of liver damage was found, though it was not always proportional even roughly to the degree of retention of the dye; also in the one patient with a normal test who died, the liver postmortem showed slight necrosis.

It may be concluded therefore that definitely abnormal retention of the dye in a patient with toxemia of pregnancy suggests that the toxemia is a severe one and suggests that it is of the pre-eclamptic rather than the nephritic type but, the degree of retention of the dye does not appear to be a reliable index of the amount of actual necrosis in the liver. A normal test on the other hand is of doubtful value unless obtained not more than a very few days before delivery or obtained repeatedly up to near the time of delivery. An accurate estimate of the practical value of the test must await further investigation.

REFERENCES

- (1) *Abel, J. J., and Rowntree, L. G.*: Jour. of Pharm. and Exp. Therap., 1909, i, 231.
- (2) *Whipple, G. H., Mason, V. R., and Peightal, T. C.*: Johns Hopkins Hospital Bull., 1913, xxiv, 207.
- (3) *Rowntree, L. G., Bloomfield, A. L., and Hurwitz*: John Hopkins Hospital Bull., 1913, xxiv, 329.
- (4) *Chesney, A. M., Marshall, E. K., and Rowntree, L. G.*: Jour. Am. Med. Assn., 1914, lxiii, 1533.
- (5) *Sisson, W. R.*: Arch. Int. Med., 1914, xiv, 804.
- (6) *Whipple, D. H., and Speed, J. S.*: Jour. Exp. Med., 1915, xxi, 203.
- (7) *McLester, J. S., and Frazier, B.*: Jour. Am. Med. Assn., 1915, lxv, 383.
- (8) *McNeil, H. L.*: JOUR. LAB. AND CLIN. MED., 1916, p. 882.
- (9) *Aaron, A. H., Beck, E. C., and Schneider, H. C.*: Jour. Am. Med. Assn., 1921, lxxvii, 1631.
- (10) *Williams, P. F.*: AM. JOUR. OBST. AND GYNEC., July, 1922, iv, 26.
- (11) *Deakin, V. R., and Graham, E. A.*: Surg. Gynec. and Obst., March, 1923, xxxvi, 348.
- (12) *Piersol, G. M., and Bockus, H. L.*: Arch. Int. Med., May, 1923, xxxi, 633.
- (13) *Rosenthal, S. M.*: Jour. Pharm. and Exp. Therap., 1922, xix, 385.
- (14) *Rosenthal, S. M.*: Johns Hopkins Hospital Bull., Dec., 1922, xxxiii, 382.
- (15) *Rosenthal, S. M.*: Jour. Am. Med. Assn., No. 26, Dec. 23, 1922, lxxix.
- (16) *Rosenfield, H. H., and Schneiders, E. F.*: Jour. Am. Med. Assn., 80, No. 11, Mar. 17, 1923, lxxx.

RECURRENT TOXEMIA OF PREGNANCY

BY FOSTER S. KELLOGG, M.D., BOSTON, MASS.

THE purpose of this paper is to call attention to some preliminary studies of certain cases of toxemia of pregnancy. I believe from this study that it is possible to regroup certain toxemias of pregnancy cases in a manner which is of great clinical importance, particularly in relation to prognosis. Recently facilities have become available through the opening of the new Boston Lying-in Hospital for the proper study of such cases, and since this proper study involves a period of considerable length, it is not yet possible to give any results from the work done there. I simply attempt now to furnish the evidence so far as it goes that led up to a feeling for the need of studying toxemias along a definite scheme and from the angle here presented.

The chief material from which the idea sprang in the order in which it became of interest, was from three sources: First, the study, several years ago and for another purpose, of 400 consecutive toxemias from the records of the Boston Lying-in Hospital. Second, the study of forty odd cases of toxemia from my own private records, and third, the study, within the last nine months, of the records and autopsies of two cases of toxemia dying at the Boston Lying-in Hospital during my service. In addition to these three main sources there have been sundry observations on other cases of toxemia seen in hospital which have tended to stimulate an interest in this phase of the problem. I will now take up the three main sources and attempt to give you briefly the ideas derived from each source.

1. From the study of the records of 400 consecutive toxemias, made primarily for the purpose of determining the relation of toxemia to uterine sepsis, certain other questions, aside from the main point, arose,—many of these having to do with the question of treatment of toxemias and not of importance to the matter in hand. Certain other questions arose, however, which were profoundly interesting and somewhat irritating which sowed the original seed of the ideas here offered. The first was that at once it became evident from the records that over and over again it was impossible to demonstrate satisfactorily whether one was dealing with chronic nephritis complicating pregnancy, or whether one was dealing with a so-called toxemia of pregnancy. About one-fourth of the 400 cases were toxemias with

*Presented as a thesis for admission to Fellowship at the Thirty-sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Philadelphia, Pa., September 19-21, 1923.

convulsions, whereas the rest were without convulsions. It had been a preconceived notion of my own, based on previous observation and on the accepted teaching in the school and hospital where I had learned my obstetrics, that chronically diseased kidneys complicating pregnancy seldom or never develop convulsions,—that it was far safer to carry them in this aspect than to carry the so-called acute toxemia. Without going into details, it became evident to me that this assumption, while possibly correct, speaking very broadly, was not nearly so true as I had believed. It is to be remembered that in these records we had, for the purposes of differentiation between chronic kidneys complicating pregnancy, the ordinary nephritis of pregnancy, and the acute toxemia, nothing to act on except sometimes a previous history and the clinical picture including the blood pressure and urinalysis, and all too infrequently, examination of eye grounds by men of varying competency, and I was left at the end of the study with the feeling that all we knew about the classification of the late toxemias of pregnancy amounted to next to nothing, and the very strong desire and hope that in time, with the erection of the new hospital, and the ability to study each toxemic thoroughly and follow it up with an adequate system, that we would be able to properly classify them, not purely for scientific interest, but because I came to feel that we were not handling these cases as well as we might for lack of adequate conception of where each case actually stood. Further, in the course of this study it became evident to me that there was a great group of cases which, though showing no clinical manifestations of chronic nephritis when not pregnant according to the ordinary methods of clinical observation, nevertheless, in all or in the majority of pregnancies, showed kidney insufficiency or toxic manifestations, and to this group I gave the name tentatively "recurrent toxemia of pregnancy," and set it aside in my mind for future study. It is with this group of cases that we are particularly concerned at present, and not with the other questions which I have suggested. To redefine what I have called "recurrent toxemia of pregnancy"; this term is applied to individuals who, while showing no demonstrable kidney lesion between pregnancies, nevertheless, in each pregnancy, or in the majority of pregnancies, show symptoms of kidney insufficiency or toxemia of pregnancy. On consulting certain monographs on toxemia of pregnancy, I found this condition has been recognized and observed in some degree under the general title of "Nephritic Toxemia or Kidney of Pregnancy" and in Kosmak's monograph (published in 1922) under the head "Nephritic Toxemia," (page 21) about a page is devoted to this condition, and in order to show the indefiniteness of present knowledge of this condition, I shall take the liberty of quoting this page.

NEPHRITIC TOXEMIA

The overburdening of the maternal kidney function during pregnancy undoubtedly serves as a starting-point for the frequent disorder to which the term "kidney of pregnancy" has been applied. In many instances an existing nephritis that can be traced to one of the exanthemata may undergo an exacerbation after years of quiescence. Every infectious disease may be complicated by nephritis during pregnancy and the prevalence of epidemic influenza during recent years, I believe, accounts for the increased number of the cases that have occurred lately. The presence of a chronic nephritis may be unknown to the patient and may make itself evident only during pregnancy, because of the increased burden placed upon the kidneys. The mere presence of albumin in the urine is not necessarily an indication of this lesion, as this may appear in minute quantities in the urine of perfectly healthy people and especially after severe exercise, but albuminuria characterized by more marked traces is associated with many pregnancies and constitutes a predisposing factor for a more serious involvement of the kidneys. In all cases where the albumin reaction averages 1 to 1,000, or more, we may assume that the normal limits have been exceeded, especially if this is accompanied by casts of the hyaline or granular variety.

Symptoms.—We find that the onset of nephritic toxemia is gradual in most instances, which serves to distinguish it from the renal symptoms in actual eclampsia. Appearing usually in the second half of pregnancy, it attacks primiparae more often than multiparae; it is also likely to be associated with multiple pregnancies. In addition to the urinary findings, edema of the ankles and legs is present in varying degrees and sometimes involves the lower portion of the abdomen. Puffiness and swelling of the hands is usually noted, although they may not be so evident as an edema. In a certain number of cases, headache, nausea, indigestion and slight visual disturbances are present.

It may be safely assumed that some direct and specific toxic factor is the exciting cause of this disturbance in the kidneys and not, as was formerly believed, a mechanical condition, such as that arising from increased intraabdominal tension, heightened blood pressure or added muscular activity during labor. Functional kidney tests seem to show that in these cases the excretory possibilities for water and salt are considerably reduced. This would point to a retention of these materials in the organism with consequent ill effect. In many cases the progress of the kidney involvement is apparently halted at this stage and no further extension of the process results. In others the incidence of more advanced toxic symptoms indicates an extension of the process clinically into a pre-eclamptic toxemia or into an actual eclampsia.

There is another group of phenomena to which attention must be called. Williams, among others, has pointed out that women who give birth to premature infants repeatedly are likely to be the subjects of this condition. It will be noted in these cases that the patient is apparently well up to the middle of her pregnancy, when albuminuria, with an accompanying edema, appears. The patient goes into labor and gives birth to a poorly nourished infant or one that is stillborn. The children are poorly nourished because of the insufficient placental nutrition, the organ in these cases being diseased and the seat of infarcts.

Following these observations, under the head "Pre-eclamptic Toxemia," I shall quote the first three sentences.

Pre-eclamptic Toxemia.—It may be difficult to draw a distinction between nephritic toxemia and that to which the term "pre-eclamptic toxemia" has been given and most cases are probably better labeled by the latter term. The clinical signs and symptoms show a marked resemblance to that class in which the kidney alone seems to play a leading part. A distinction may be made, how-

ever, in that the evidences of specific kidney lesions are less well defined and we may have presented simply the picture of a toxic disturbance.

It may be said then that I am making an effort in these observations to give more definiteness to the matter spoken of in the above quotations, and to point out what I am forced to consider of great importance, namely, placing this matter on a more satisfactory basis.

Having shown you the source of the idea of "recurrent toxemia of pregnancy" from source 1, I shall now take up source 2, namely, observation of forty-one toxemias seen in private practice, and show what these cases seem to demonstrate to me. Following the war I came into close association with an internist, and with this opportunity began to study all possible toxemias, which I saw in private practice, with his help. We began to have cases coming to us in the course of private practice who belonged in our minds in this class of recurrent toxemia of pregnancy. I am not going to burden you with individual case histories, but these selected cases all presented more or less the same history of repeated toxemia in two or more pregnancies. These patients were immediately turned over to the internist who went to work to establish to the best of his ability whether or not they had chronic nephritis. Some did, but most of them did not. Whether or not they did, they were all treated by the internist on the same basis, namely, that they did have kidney insufficiency, or that they would have it in the course of the pregnancy. This treatment consisted of the ordinary nephritis diet, rest each day and ten hours' sleep every night, absolute freedom from worry and care insofar as possible, absolute freedom from any hard work or getting tired. This included every form of exercise except moderate walking and every form of work, together with a thing which we had come to feel was most important of all, namely, absolute freedom from exposure to wet and cold. All these matters, simple enough and well known, we felt very important because I had again and again been impressed with the kidney insufficiency, shown by traces of albumin and elevated blood pressure, appearing in women following an afternoon's shopping in the wet or similar exposure. We soon began to find that under this care patients who had never before done so were going through their pregnancies without manifesting any signs of kidney insufficiency. These cases ranged all the way from recurrent miscarriages, which ordinarily often would fall under the head of habitual abortion, to the type case in which the patient had had induction of labor three times in succession and all three done by high class obstetricians for toxemia of pregnancy, each time somewhat earlier than the time before, and who under the care outlined above went through two pregnancies without manifestations of toxemia or kidney insufficiency. In addition to these observations, we had certain patients who showed no chronic kidney lesion, so far as the

internist's study could demonstrate, and who could not be made to understand the importance of these precautions, and who developed kidney insufficiency or toxemia on breaking the above named rules in such a definite way that we were impressed negatively as well as positively by the importance of these rules. For example, a doctor's wife had been delivered six years previously at seven and one-half months for fulminating toxemia and in the ensuing five years she had had four miscarriages between the third and fourth months, each time with slightly elevated blood pressure and very small trace of albumin. The fifth pregnancy, having demonstrated that she had no chronic nephritis between pregnancies, we pressed her to follow the careful routine life above outlined. She went along to five months without showing any kidney insufficiency,—she had felt fetal movements and was much encouraged at the trend of events. She wished to give a party and got up and broke her routine, running about all day and sitting up late at night. The next day she called on the telephone and announced that the fetal movements had ceased. Her husband took her blood pressure and found that it had risen twenty points and she had a slight trace of albumin. Two days later she miscarried a slightly macerated fetus of somewhat over five months.

In addition to these we had certain cases in which, in spite of the best possible care, toxic symptoms occurred in the pregnancy, necessitating induction or resulting in premature labor.

Two other facts stood out in the study of these cases which had previously impressed me in the study of the larger series from the Lying-in Hospital records (Source 1). First, that *occasionally* a true chronic kidney, which had been neglected in one pregnancy and had resulted in premature labor and the loss of the baby, or necessitated induction, could be taken through to a live baby under the best possible care as outlined above; and second, that the prognosis for the child in *most* chronic kidneys complicating pregnancy was bad, and that a repetition of pregnancy in these cases simply further damaged the kidney each time and left the woman worse off in health afterwards.

At this time I shall make no analysis and detail no cases in this group of forty-one cases studied. The series is too small to be of value statistically. I will say, however, that of these forty-one cases, not a few of which were seen late in consultation, and so inadequately studied and more or less lost track of subsequently, eight appeared on close study to belong certainly to the group of recurrent toxemias. We may say then that insofar as this insufficient number would indicate, approximately 15 per cent of all toxemias and chronic kidneys complicating pregnancy seen belong in this recurrent toxemia group. The figure in itself is of no particular value or importance, but serves roughly to indicate that this group is not negligible. In

several of these eight cases we have been able to place the patients subsequently in the hospital and do complete urinalyses, phenolsulphone-phthalein test and two-hour test, blood pressure, blood chemistry, ophthalmoscopic examinations, liver function test, etc., as I shall hereafter indicate in relation to the way in which we are now handling all toxemias in the hospital. The number is so few and the work so new to us that I shall say nothing now concerning these tests on these patients save that such investigation tended to demonstrate that these cases were not chronic kidney cases and did belong definitely in the group of recurrent toxemias.

The above observations tend to demonstrate theoretically that what I have designated as recurrent toxemias is a clinical entity, but the proof that such condition actually existed was lacking until this year when I was on service at the hospital (Source 3). During this service two patients were admitted and died in the hospital, and had partial autopsies, which demonstrated to me conclusively the existence of recurrent toxemia of pregnancy. These cases are so interesting in themselves and of such importance to the proof of my contention that I give them in detail together with the autopsy findings, including past histories. The pathologic material was examined in the laboratory of the Harvard Medical School. The material was taken fresh a few hours after death. Below are these cases in detail.

CASE 1.—Mrs. McN., No. 29980, para iv, age forty, admitted May 11, 1923.

In May, 1918, the patient was admitted in the eighth month of her pregnancy because of bleeding. A diagnosis of partial separation of the placenta was made and a Voorhees bag was inserted. Five hours later the patient was delivered normally of a stillborn baby weighing less than four pounds. After the birth of the baby a large amount of blood clot came away, and the placenta showed evidences of marginal separation. The patient apparently had no toxic symptoms but there is no further history recorded. Neither the blood pressure nor the urinary findings were noted. Patient had an uneventful convalescence and was discharged on the eleventh day well.

In November, 1918, she had a miscarriage at about ten weeks. In June, 1919, she reported to the clinic two months' pregnant. She had a blood pressure of 120 and her urine was negative. She had no symptoms until near the end of the fifth month when she began to have occasional headaches and slight edema. Early in the sixth month her blood pressure rose suddenly to 180 and she was sent into the hospital. She was treated for four weeks by rest in bed and free catharsis with salts. Blood pressure varied between 150 and 190 and urine showed a slight trace of albumin. The phthalein test was thirty per cent. She then went into labor and was delivered normally of a macerated fetus. The placenta showed marked degeneration. She at no time had any toxic symptoms other than an occasional slight headache and slight edema of the feet. Convalescence was uneventful. She was discharged on the fourteenth day blood pressure 140, urine still showing a slight trace of albumin. Clinical diagnosis, chronic nephritis.

She was not seen again until the present admission when she was sent into the hospital by a physician who saw her for the first time that day and found her flowing profusely. No further history was obtained. On admission she

presented the characteristic picture of an acute separation of the placenta. Uterus was hard and tender and she was flowing moderately. She was between seven and eight months' pregnant. Blood pressure and urinary findings were not recorded. She was in fairly good condition and was delivered at once by cesarean section. The uterus showed the usual hemorrhagic infiltration of the wall but it contracted well and was not removed. At the conclusion of the operation her pulse was 130 and of good quality. Two hours later her blood pressure was 140 and she appeared to be doing very well though she was flowing somewhat more than a normal case. The pulse rate did not go up. About six hours after operation she collapsed very suddenly and died before a transfusion could be given.

Permission for complete autopsy was refused but the abdomen was inspected by reopening the incision. The uterus was empty and firmly contracted. There had been no bleeding into the abdominal cavity. The surface of the liver was pale and mottled with small hemorrhages. Portions of the liver, kidneys and uterus were removed for microscopic examination. Diagnosis:—Hemorrhages into the uterine musculature; acute, hemorrhagic and necrotizing hepatitis confined mostly to the periportal areas; *acute* diffuse nephritis.

It will be noted (1) that on history this patient in her third pregnancy was diagnosed clinically as chronic nephritis and so treated, expectantly by several members of the staff, with a blood pressure of 190, which is practically never done if the case is considered an acute toxemia, (2) that at autopsy there was no chronic nephritis but the acute nephritic kidney of toxemia of pregnancy.

CASE 2.—Mrs. H., No. 30095, para iv, age thirty, admitted July 14, 1923.

First pregnancy was normal and ended in 1916 at full term with a normal delivery. In 1918 the patient had a miscarriage at four months. In December, 1921, the patient entered the hospital in the eighth month of her third pregnancy. She had not felt the baby move for several days. The day before admission she had been suddenly seized with a moderately severe pain in the right lower quadrant and had begun to flow. On entrance she was in labor and was flowing slightly. The uterus was tender over the lower half and was not relaxing well between pains. There were no other symptoms. The systolic pressure was 112. Fetal heart was not heard. She was delivered normally in five hours of a stillborn baby. The placenta followed promptly and was found completely covered with an adherent clot. A considerable amount of blood was passed after the birth of the baby. Patient had an uneventful convalescence and was discharged well on the fourteenth day.

On June 10, 1923, the patient entered the hospital because of severe epigastric pain. She had vomited once or twice. She had no headache, blurring of vision or edema. Marked tenderness in the epigastrium, no spasm or jaundice. B. P. 168/68. Urine showed a large trace of albumin and many hyaline and granular casts. A Rosenthal liver function test showed 6 per cent of the dye in the blood at the end of 15 minutes, 6 per cent at the end of one hour and none at the end of two hours. She was given a quarter of a grain of morphia and the following morning was much improved. Her epigastric pain had stopped and did not recur during this stay in the hospital. Her blood pressure came down and her urine cleared up rapidly. Phthalein test was 60 per cent. Blood taken the night of admission showed in the plasma an N. P. N. of 26.6, (mg. per 100 c.c.) B. U. N. 17.5, uric acid 7.3. On the eleventh day she was discharged with a blood pressure of 110, a negative urine and no symptoms.

Eleven days after discharge she was seen in the pregnancy clinic when she had a B. P. of 118, a trace of albumin and no symptoms. A week later on July 9 she was seen again in the clinic with the same B. P., a trace of albumin and no symptoms. On the morning of July 14 she entered the hospital again because

of steady severe epigastric pain which she had had for about six hours. She had severe nausea and had vomited several times, had moderately severe headache, and slight blurring of vision. B. P. was 188 systolic and urine showed a very large amount of albumin. The liver function test was repeated and at the end of 15 minutes there was 9 per cent in the blood, after one hour, 8 per cent, and after two hours, a trace. There was marked tenderness in the epigastrium. There was no jaundice, no edema and no bleeding.

A Voorhees bag was inserted about noon and the patient delivered normally of living, active eight months' baby at 3 P. M. About half of the maternal surface of the placenta was dark brown and necrotic looking. She bled rather more than a normal amount at delivery but appeared to be in good condition, pulse was 120, of good quality, B. P. 128. She continued to have very severe epigastric pain and about an hour after delivery went into severe shock from which she did not react. She had no convulsions or coma but died about three hours after delivery. Permission for complete autopsy was refused but a portion of the liver which was secured showed a pale cut surface mottled with small hemorrhagic areas. Microscopic examination showed an acute, hemorrhagic necrotizing hepatitis chiefly in the periportal areas. Section from a portion of the right kidney showed an apparently beginning acute diffuse nephritis.

This case is less convincing and necessitates the assumption that the separation of the placenta terminating the third pregnancy was toxemic in character, as well as the second four months' miscarriage, an assumption study of the private series shows not unfair, but is considered worth while reporting in this connection.

I have come to feel from the above that all toxemias both in private and hospital practice should be studied by some system which will enable us sooner or later to throw each case into one or another of these groups, namely, (1) definite chronic kidney, (2) recurrent toxemia of pregnancy and (3) acute toxemia of pregnancy. I am impressed by the fact that because we have not been able to do this, we have wasted kidney reserve in many chronic kidney cases in attempting to carry the patient toward term to no purpose; that we have mishandled the recurrent toxemia group by not recognizing it and not handling it with the strictest prenatal care, and I believe that once a patient has had a toxemia of pregnancy, she should be treated as though she were going to repeat it and belonged in the recurrent toxemia group until we find that she does not belong to this group by the test of complete pregnancy.

With this idea in view, we have outlined the following scheme for prenatal, natal and postnatal care for every case coming into the hospital in the future. This work was only possible by the establishment this year of a postnatal clinic, and of a pretty nearly absolute follow-up system. The outline itself embodies the ideas of some of the staff and the resident who is engaged in the actual follow-up work as well as in the laboratory work done on all toxemias. This outline is tentative and can undoubtedly be improved upon, but I feel it represents the way in which toxemias should be studied everywhere from our present knowledge.

ROUTINE STUDY OF TOXEMIC CASES

As soon as possible after admission a catheter specimen is examined and the Rosenthal liver function test is done. At the time that the liver function test is done blood is taken for blood chemistry. As soon as practicable a phenolphthalein renal function test is done. On cases which are being treated conservatively a daily urine specimen is examined and the other tests are repeated if it seems advisable to do so. Eye grounds are examined.

On the twelfth or thirteenth day after delivery a catheter specimen is examined, the phthalein test and the blood chemistry are repeated and the liver function test is repeated if the first one showed any deviation from normal.

All patients at the time of discharge are given a date on which to return to the postpartum clinic. This is ordinarily six weeks from the date of delivery. When they return to the postpartum clinic the toxemic cases in addition to the ordinary examination have their blood pressure taken and their urine examined. They are given a date some time within the next month on which to re-enter the hospital for observation. On this date the patient is admitted in the afternoon or evening and has a phenolphthalein renal function test done. The following morning her blood is taken for blood chemistry and she is started on a two-hour renal test. An albumin test is done on each specimen and several sediments are examined. The liver function test is repeated only if it has been abnormal the last time it was done. On the second morning the patient is discharged.

Cases which fail to return to the postpartum clinic are followed by the Social Service workers and induced if possible to come back for examination.

These cases are then grouped in a "Toxemic Index" under one or another title so that on reappearance in another pregnancy the group to which they are considered to belong, together with the data on which this decision was based, are available to the men on service.

I believe that we are justified in drawing the following conclusion tentatively from these observations. 1. That recurrent toxemia of pregnancy is a clinical entity distinct from chronic kidney disease complicating pregnancy and different from the acute single toxemia of pregnancy. 2. That whereas further investigation along laboratory lines may show that this group consists of patients who have a faulty kidney balance, that is, a balance that allows them to live without kidney manifestations when not pregnant, but when the load of pregnancy is added develop kidney insufficiency, we are not at present in a position to say that this is true. 3. That this group of recurrent toxemia of pregnancy may be subdivided judging by results into two classes—(1) in which the prognosis under the strictest possible prenatal care is good for both mother and child, and (2) in which the prognosis for the child is bad no matter what prenatal care is instituted. This division is not to my mind sufficiently recognized even by those who have felt that the grouping I have used here is clinically correct, and it is on this point that I would lay especial emphasis because it is of tremendous importance to certain individuals that, in spite of previous failures to obtain a living child, they can be taken through pregnancy and a living child obtained.

UTERINE PROLAPSE, CYSTOCELE, RECTOCELE. AN
ANALYSIS OF SIXTY-THREE CONSECUTIVE CASES
OPERATED UPON BY THE VAGINAL ROUTE

BY LOUIS E. PHANEUF, M.D., F.A.C.S., BOSTON, MASS.

(Associate Professor of Clinical Gynecology, Tufts College Medical School.
Gynecologist and Obstetrician, Carney Hospital)

THE woman with a slight degree of prolapse of the uterus associated with a slight cystocele and rectocele usually requires no operative interference during her childbearing period. The two main reasons for intervention before the menopause are extensive lacerations of the cervix with the resultant leucorrhea and the increased frequency of abortion and miscarriage, and procidentia with the uterus, bladder and rectum extruded, making the patient an invalid. The two reasons which stand out against surgical intervention during the childbearing age are, first, the danger of complicating future labors, since many cases are on record of women who had had one or more children by the pelvic route, and later had to be subjected to abdominal deliveries because of previous operations for the repair of lacerations of their genital tracts; and, secondly, because of the danger of recurrence of the conditions if the patients thus treated are subsequently delivered by the natural passages. Most operators, however, agree that when a woman has reached the menopause, if the lesions above mentioned are at all severe, they should be repaired so as to allow her to spend the rest of her years in comfort.

Uterine prolapse, although a source of many discomforts, does not threaten life; for this reason, if we are to recommend operation for this condition it is important to find a method attended with little operative risk, and at the same time one which will offer as good a chance of a cure as possible. After trying many of the accepted methods, both vaginoabdominal and vaginal, for surgically treating prolapse, I now prefer the vaginal route for patients at or after the menopause.

Of the sixty-three consecutive operations in this series, sixty were performed at the Carney Hospital and three in other hospitals; the ages of these patients are grouped in Table I.

As previously stated, all cases were operated upon vaginally; the transposition operation was chosen as the method of election and was performed on fifty-eight of the patients, while five had vaginal pan-

*Read at the Thirty-sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Philadelphia, Pa., September 19-21, 1922.

TABLE I.

AGES					AGES				
Between	40	and	45,	17	Between	65	and	70,	1
"	45	"	50,	17	"	70	"	75,	1
"	50	"	55,	14	"	75	"	80,	1
"	55	"	60,	7	"	80	"	85,	1
"	60	"	65,	4	Total				63

The oldest patient was 82 years old.

Table II shows the diagnoses in detail.

TABLE II.

DIAGNOSES

Procidentia	51, or 80%
First and second degree prolapse with cystocele and rectocele	12, or 20%

ADDITIONAL DIAGNOSES

Ulcer of vagina	2
Carcinoma of cervix (epidermoid)	1
Cervical polypus	5
Ovarian cyst	1
Diabetes	1
Myomata uteri	1
Cyst of perineum	1
Third degree laceration of perineum	1

hysterectomies with transposition of the united broad ligaments between the bladder and the vagina (modified Mayo technic). In connection with the fifty-eight transposition operations, amputation of the cervix was performed forty-six times; this was done on all cases where hypertrophy, elongation or laceration of the cervix was present. In all cases a colpoperineorrhaphy and, where an enterocele was present, obliteration or, better, shortening of the culdesac of Douglas, completed the operation.

The cases called suitable for the transposition operation were those where the uterus was normal in size or hypertrophied. Our experience has borne out Watkins' statement: "A uterus transposed that is too large never gives trouble afterwards because of remaining large. It always atrophies."¹ On the other hand, we have found by experience that the senile atrophic uterus does not adapt itself well to this procedure because the heavy bladder will push it down again. If that type of uterus is transposed, the cervix may subsequently appear at the vulva although the cystocele does not recur. The overlooking of this fact accounts for the three recurrences, Cases 6, 22, and 33, in this series, or a recurrence of 4.76 per cent. So far no recurrence has been observed where a uterus of suitable size was transposed. In the three women who were not relieved by this operation, the uteri were exceedingly small, one was the size of a large English walnut. The recurrences were treated by fixing the transposed uterus to the ab-

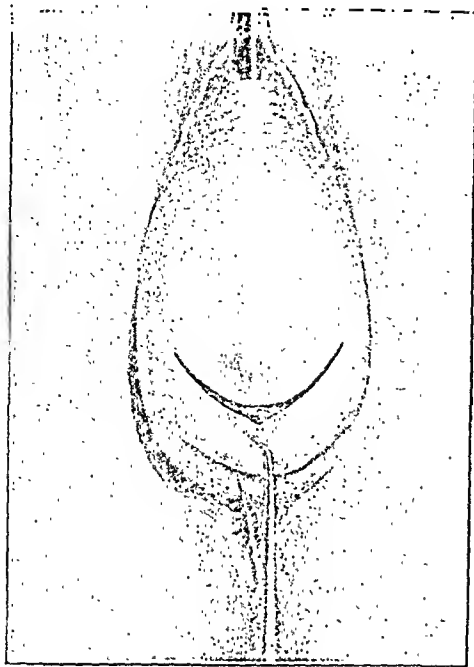


Fig. 1.—Male sound in the bladder with point towards operator to indicate bladder reflection and where first incision is to be made.

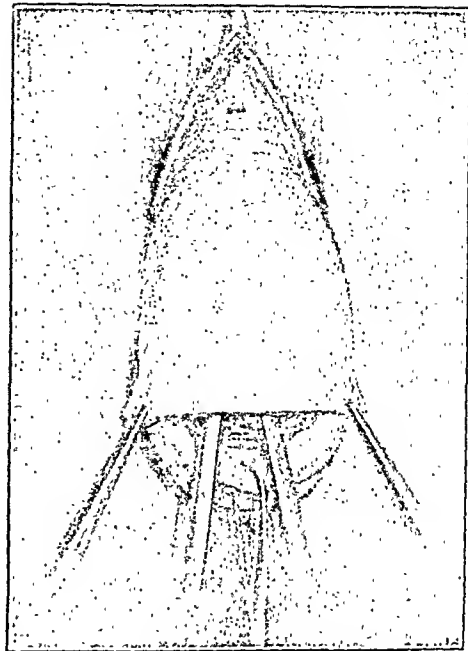


Fig. 2.—Upper edge of first incision drawn down and held taut by two Ochsner clamps, while the bladder is being separated from the fascia of the anterior vaginal wall by curved sharp-pointed scissors.

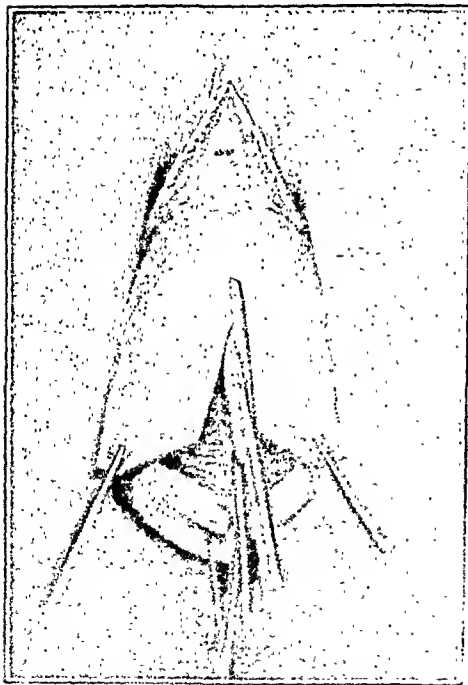


Fig. 3.—Incision of anterior vaginal wall, fascia and mucosa, in the median line.



Fig. 4.—Bladder freed entirely of fascia from fundus to vaginal neck. The vaginal flaps consist of fascia and overlying mucosa.

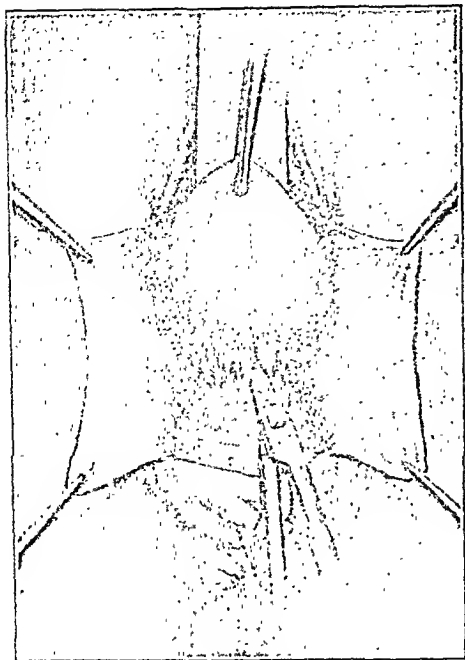


Fig. 5.—The bladder is pulled upwards with smooth tissue forceps, exposing the utero-vesical ligament which is being cut.



Fig. 6.—The bladder is held under a retractor and the utero-vesical peritoneum is picked up and opened.

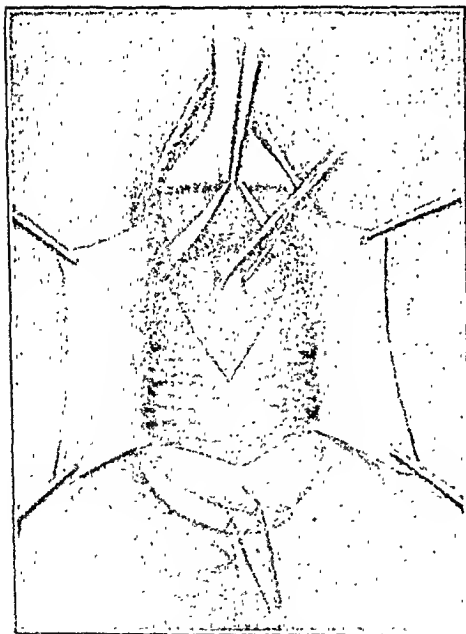


Fig. 7.—The peritoneum has been opened and the uterus is being delivered into the vagina.

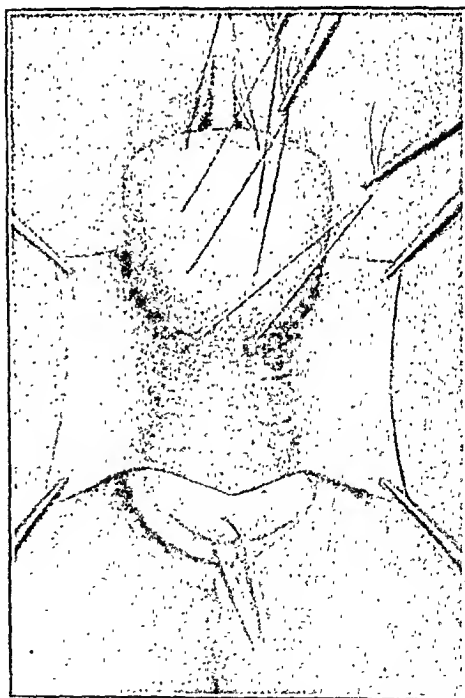


Fig. 8.—The uterus has been delivered into the vagina and the utero-vesical peritoneum has been sutured to its posterior surface at the level of the internal os. Four sutures of large chronic catgut are placed deeply into the uterus, in the median line. The lowermost stitch is placed at the junction of the corpus uteri and the cervix.

dominal wall; the final result was satisfactory but it necessitated a laparotomy which these patients were reluctant to undergo. Cases of that type are now treated by removing the uterus vaginally, suturing the broad ligaments together, and transposing them between the bladder and vagina. Five cases were operated upon by this method and so far no recurrences have been found. I have met but once a uterus that, although prolapsed, was too large to be transposed; this was in a younger woman, a good surgical risk, and she was relieved of her symptoms by a cervical amputation, anterior colporrhaphy, colpoperineorrhaphy, abdominal supravaginal hysterectomy and fixation of the cervix to the anterior abdominal wall.

Several methods have been advocated to reduce a large uterus in size before transposing it. Of these, two are in common use. The first consists of the excision of a wedge-shaped piece in the anterior uterine wall, suturing the incision thus made, and transposing the smaller uterus; if this method is resorted to, it is of advantage to remove the uterine and cervical mucosa. The second method is that of Vineberg² and consists of a vaginal supracervical hysterectomy with transposition of the cervical stump. We have not resorted to the first modification since it predisposes to suppuration. Vineberg has reported excellent results for his operation, but thus far we have not had the opportunity of trying it.

The two cases of ulceration of the vagina were kept in bed until their ulcers were healed before they were subjected to operation. Carcinoma of the cervix, although a rare complication of prolapse, occurred in one of the cases of this series; this was an epidermoid new growth grafted on an ulcer of the cervix of long standing; at the time of operation (vaginal hysterectomy) the neoplasm was circumscribed and, so far, the disease has not recurred. There were five cervical polypi which were removed from the cervix previous to amputation. One case was complicated by an ovarian cyst too large to be safely removed through the vagina; for this reason an abdominal cystectomy was performed two weeks after the plastic operation. The diabetic was made sugar-free before operation; she made an uneventful recovery and the vaginal incisions healed by first intention. In one case several myomata had to be enucleated before the uterus could be transposed. One patient had had a previous perineal repair elsewhere; it was found that some of the vaginal mucosa had been turned in at operation, so that a cyst the size of a small egg had developed in the perineum. This was removed while denuding at the second repair. All lacerations of the perineum encountered were of the second degree except one which was of the third degree; the repair in this case gave a satisfactory result.

TABLE III.

OPERATION	
Transposition operation	58
Vaginal panhysterectomy and transposition of broad ligaments (modified Mayo technic)	5
Colpoperineorrhaphy	63
Amputation of the cervix in the 58 transposition operations	46

Nitrous oxide-ether anesthesia was administered sixty-one times, while spinal anesthesia was resorted to twice, and this because the patients had myocarditis and were thought to be poor risks for a general anesthetic. While these operations may be done perfectly well under spinal anesthesia, we have reserved it for special conditions, feeling, as we do, that ether anesthesia, where no contraindications exist, is as safe a method as there is.

TABLE IV.

ANESTHESIA	
Nitrous Oxide Ether	61
Spinal Anesthesia	2

TECHNIC OF OPERATION

I. Transposition Operation.—The interposition operation for uterine prolapse and cystocele was first described by Watkins in 1899¹; later, in 1921,² he suggested the name transposition operation as a better term. His original operation is the foundation upon which the following technic was built.

Traction is made on the cervix by means of double hooks, a male sound is introduced in the bladder with the point toward the operator; by raising the tip of the sound, the bladder attachment to the cervix is clearly shown, a transverse incision is made through the vaginal mucosa and fascia below the point of the sound, which is then removed. It is very important to go through the fascia. The fascia and mucosa are grasped with Ochsner clamps, one at each limit of the incision, sharp-pointed scissors are introduced under the fascia and separate this with the overlying mucosa from the bladder up to about two and a half centimeters from the urinary meatus. The scissors are separated before they are withdrawn and the flap is incised in the median line with straight uterine scissors. The bladder is now separated as far as possible laterally, the uterovesical ligament, which holds the bladder to the cervix, is cut and the former is easily separated from the uterus. The bladder is now held under the symphysis by means of a retractor, the uterovesical peritoneum is opened, the fundus of the uterus is delivered into the vagina, and the peritoneum is sutured to the posterior uterine wall at about the level of the internal os. Four chromic catgut sutures are placed in the uterus: the first takes a deep bite in the fundus, the second is placed in the anterior wall two centimeters below the first, the third is similarly placed, while the fourth goes in deeply at the junction of the corpus and cervix where an angle exists. This last stitch, described by Johnson,⁴ when threaded through the vaginal wall and tied, straightens out the uterus and throws the cervix well back in the pelvis. We prefer this to the shortening of the sacro-uterine ligaments, a procedure recommended by Jelleff⁵ to accomplish the same

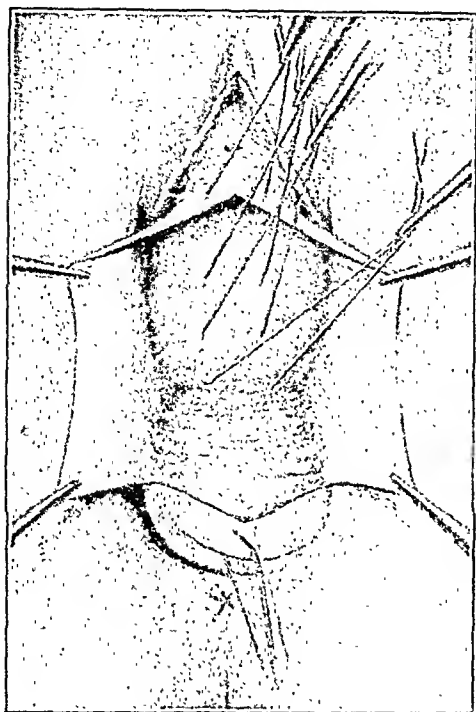


Fig. 9.—The upper stitch has been rethreaded and passed through the anterior vaginal wall, fascia and mucosa. After the excess of anterior vaginal wall has been cut away, the remaining three sutures are rethreaded, passed through the fascia and mucosa, and the four large sutures are tied. The lowermost stitch when tied straightens out the uterus and throws the cervix well back.

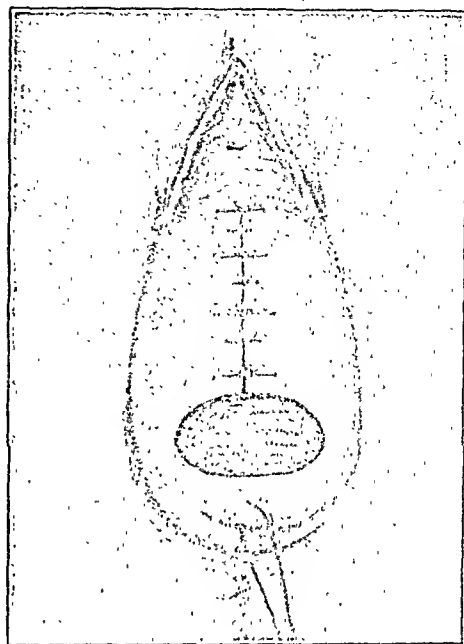


Fig. 10.—The four large sutures have been tied and intermediate sutures of finer catgut have been placed between them. The intermediate sutures also pick up the uterus, so that no dead spaces are left.

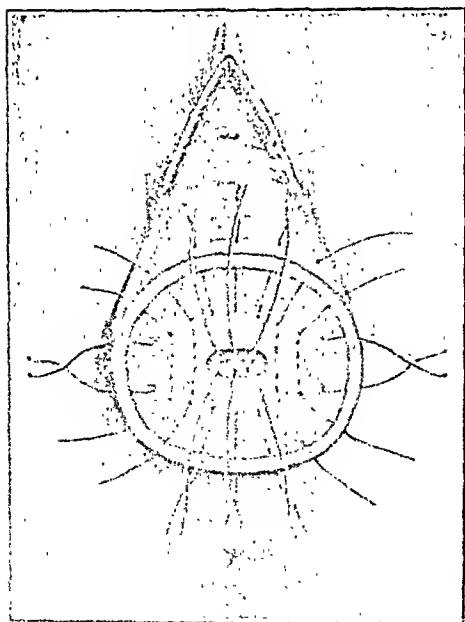


Fig. 11.—Amputation of the cervix and the sutures in place. The mattress suture at each angle is important because it obliterates a dead space.

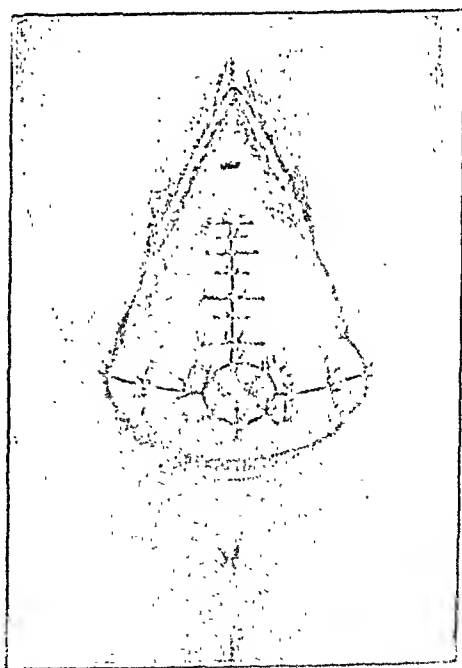


Fig. 12.—The interposition operation and the amputation of the cervix have been completed. Note the roomy external os. The uterus is now pushed back in the vagina.

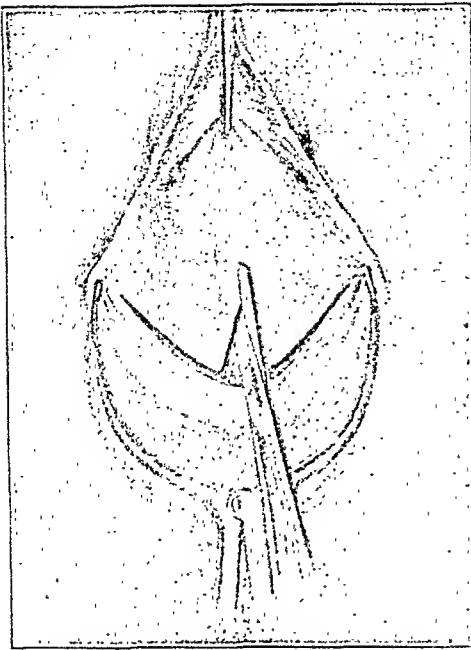


Fig. 13.—A self-retaining perineal retractor is introduced, the points entering below the ducts of the vulvo-vaginal glands. The crest of the rectocele is picked up by a forceps and the pelvic floor is opened by a curved incision at the mucocutaneous border. The rectum is separated from the fascia of the posterior vaginal wall by curved sharp-pointed scissors, and the flap, fascia and mucosa, is incised in the median line.

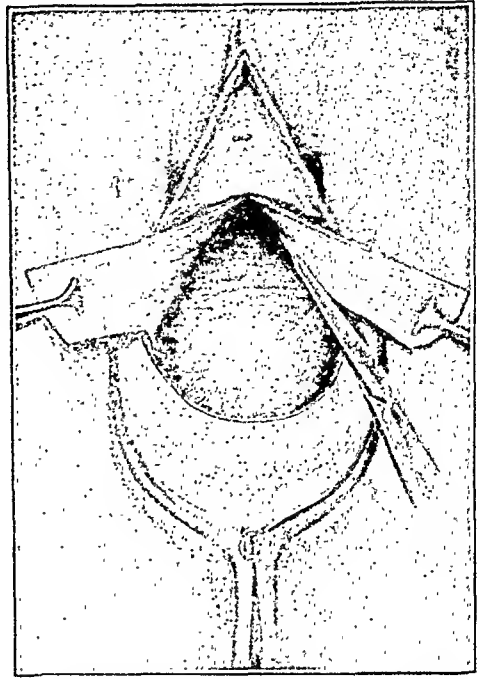


Fig. 14.—The rectum has been exposed and the excess of posterior vaginal wall, fascia and mucosa, is being cut away.

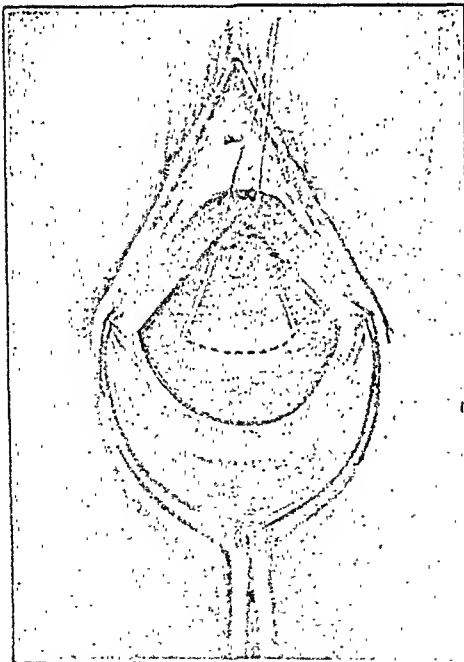


Fig. 15.—A mattress suture of chromic catgut attaches the rectum to the unstretched upper portion of the vagina. This stitch is tied above the upper angle of the denudation.

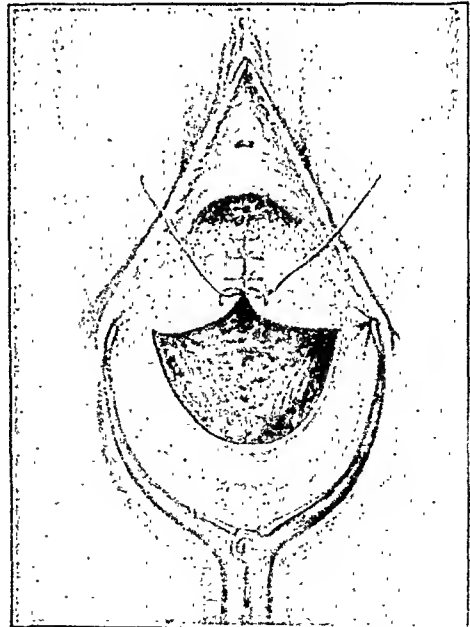


Fig. 16.—The posterior vaginal wall has been closed with interrupted sutures of chromic catgut. The levators covered with their fascia are exposed.

purpose. Furthermore, we feel that this stitch is a most important one and that it helps greatly to the success of the operation. The excess of the flaps, fascia and mucosa, is now cut away, the four sutures are rethreaded, passed through the vaginal wall and tied, and the spaces between these four sutures are closed in with interrupted sutures of chromic catgut, each stitch taking a deep bite of the uterus, so that no dead spaces are left between the uterus and the vagina, an important step in preventing the formation of a hematoma and suppuration. We do not separate the fascia from the mucosa, as we believe that equally good support may be obtained if the two layers of tissue are sutured together.

The cervix is amputated by the Emmet method, chromic catgut being used entirely as suture material.

The perineum is repaired in the following manner. A Gelpi self-retaining retractor is introduced, the points entering the tissues just below the ducts of the vulvovaginal glands, the high point of the rectocele is grasped, in the median line, by an Allis forceps, while posteriorly a similar instrument picks up the mucoeutaneous border, also in the median line. The pelvic floor is opened by an incision extending from the point below the right duct of Bartholin to the posterior Allis forceps and then extending upward to the point below the duct of the vulvovaginal gland on the left. The anterior edge of the incision is picked up with tooth forceps, and sharp-pointed scissors are introduced between the rectal fascia and the rectum, the separation is carried upward to the cervix, when the scissors are separated and withdrawn. The fascia and the overlying mucosa are now incised in the median line with straight uterine scissors and the flaps are separated from the culdesac and rectum above, and from the pelvic slings below. The excess of posterior vaginal wall is cut away, thus leaving a diamond-shaped area of denudation. If an enterocele is present, the culdesac is opened, dissected free on all sides and removed as a hernial sac, the opening is closed by suturing the sacrouterine ligaments together, from side to side, as suggested by Ward,⁶ Frank,⁷ and others. In the absence of an enterocele we do the rectopexy recommended by Ward.⁶ The upper part of the vaginal incision is now closed by interrupted chromic catgut sutures, each one picking up mucosa and fascia, until the upper edges of the levators are reached. These muscles, covered by their fascia, are approximated in the median line, in front of the rectum, by means of three interrupted chromic catgut sutures, the triangular ligament is approximated by a continuous stitch of fine chromic catgut, and the external perineum is closed by a subcuticular stitch of the same material.

II. Vaginal Panhysterectomy with Transposition of Broad Ligaments. (Modified Mayo Technic.)

The technic is identical with that of the transposition operation until the uterus is delivered into the vagina. The culdesac of Douglas is then opened, an Ochsner clamp is applied on each side of the cervix, taking in all the parametria from below, while a similar instrument is applied from above on each broad ligament in such a way that it meets the lower clamp of the same side, and the uterus is removed. The tubes and ovaries may be removed or not, according to indications. After the removal of the uterus, the clamps are brought together and the broad ligaments are united by a continuous mattress suture of large chromic catgut; this suture is placed two to two and a half centimeters from the cut edges and serves as a hemostatic as well as an approximating stitch. The raw edges are carefully turned in with fine chromic catgut. The excess of the vaginal flaps, fascia and mucosa are cut away, the upper edge of the united broad ligaments is sutured to the upper angle of the vaginal wound and the rest of the incision is closed with interrupted sutures of chromic catgut, each one pick-

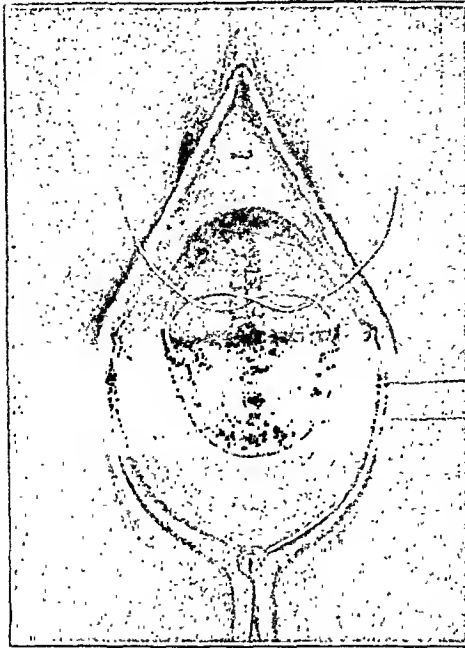


Fig. 17.—The posterior vaginal wall has been closed with interrupted sutures. The levator ani muscles, and the fascia covering them, are being approximated by three chromic catgut interrupted sutures. The uppermost stitch is being tied.

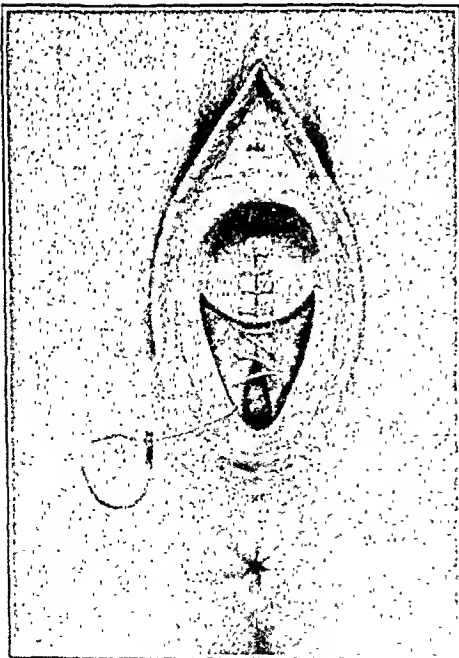


Fig. 18.—The posterior vaginal wall has been closed and the levators and their fascia have been approximated. The triangular ligament is being approximated by a continuous stitch of fine chromic catgut.

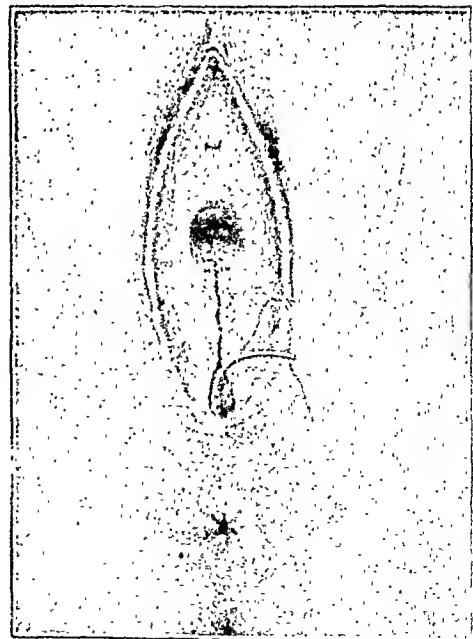


Fig. 19.—Closing the vaginal wound with a subcuticular stitch of fine chromic catgut.

ing up the broad ligaments. These ligaments are thus placed between the bladder and the vagina and act as a support for the former. The perineum is then repaired by the method described above.

TABLE V.

RESULTS

Mortality	0
Result satisfactory	60
Recurrences	3, or 4.7%

The absence of mortality in a series of sixty-three women, a number of them advanced in years and physically worn out by hard work, leads one to infer that this method is safe. All patients were examined at the time of their discharge from the hospital and were asked to report a month later for further examination. At this time they were asked to return if the least signs of "falling down of the parts" became evident. To date but three recurrences have been found, and these, as we have explained above, were due to the fact that we had transposed uteri which were too small. Were we doing these cases now, we would use the second method described.

The first case was operated upon January 4, 1916; the last case on December 9, 1922.

CONCLUSIONS

1. It is generally considered that at, or after, the menopause, the vaginal route offers a safe method of treating women with uterine prolapse, cystocele and rectocele.

2. Vaginal operations are attended with a comfortable convalescence, and may be done on old women where an extensive laparotomy would be contraindicated.

3. We advocate the transposition operation in cases where the uterus is normal in size or hypertrophied.

4. When dealing with an atrophic uterus we have obtained better results with the vaginal panhysterectomy with transposition of the united broad ligaments. (Modified Mayo Technic.)

5. If, in doing the transposition operation, the incision in the anterior vaginal wall is made as described, the fascia and overlying mucosa will be an entity, and will help greatly in keeping the uterus in exaggerated anteversion.

6. Failure is apt to be the case if the uterus is attached to the vaginal mucosa only.

7. A stitch introduced at the juncture of the cervix and corpus is important because when passed through the vaginal flaps and tied, it holds the cervix well back in the pelvis.

8. The bladder should be well separated from the vagina and uterus so that it will lie smoothly, and not in folds, on the transposed uterus.

9. An adequate repair of the pelvic floor is essential in all cases.
10. Spinal anesthesia may be used to advantage in cases where the use of a general anesthetic is contraindicated.

BIBLIOGRAPHY

(1) *Watkins, Thomas J.*: Am. Jour. Obst., 1899, xv, 420-423. (2) *Watkins, Thomas J.*: AM. JOUR. OBST. AND GYNEC., 1921, ii, 424. (3) *Vineberg, Hiram B.*: AM. JOUR. OBST. AND GYNEC., 1921, ii, 368. (4) *Johnson, F. W. and Phaneuf, L. E.*: Surg., Gynec. and Obst., 1919, xxviii, 418-423. (5) *Jelletti, Henry*: Surg., Gynec. and Obst., 1923, xxxvi, 119. (6) *Ward, George Gray*: Jour. Am. Med. Assn., 1922, lxxix, 709-713. (7) *Frank, Robert T.*: AM. JOUR. OBST. AND GYNEC., 1923, v, 8.

395 COMMONWEALTH AVENUE.

THE CONSTRUCTION OF AN ARTIFICIAL VAGINA, WITH REPORT OF A CASE

BY C. JEFF MILLER, M.D., NEW ORLEANS, LA.

CASE L. R., white, age nineteen, was admitted to my service at Charity Hospital in February, 1921. She had had the usual diseases of childhood, but her past history was entirely negative otherwise, except for the fact that she had never menstruated. At 14 she began to have attacks of abdominal cramps, at times so severe that a physician was called to see her, and with these attacks her breasts enlarged and became quite painful. She paid no attention to date at the time, but she now believes that these attacks simulated the normal menstrual cycle. They continued for several months, then disappeared entirely, and have never recurred. For several years her failure to menstruate was not regarded as abnormal, but when at 17 the flow had not appeared, she consulted a physician, who, after examination, told her she had no vagina. Shortly afterwards she was examined under anesthesia, and the hymen ruptured, but the vagina could not be re-established. Two years later she planned to be married, and entered the hospital for operation.

Examination showed a white female, about 5 feet 2 inches in height, weight about 120 pounds, appearance entirely feminine. Her color was extremely sallow. The general examination was negative, except that both kidneys were palpable and ptosed. The labia majora and minora were present, and apparently normal, as was the clitoris, but there was no evidence of a vagina.

The routine laboratory tests proved negative, and four days after admission a typical Baldwin operation for the construction of an artificial vagina was done under ether anesthesia, the entire procedure consuming about forty minutes. Examination of the pelvis after the abdomen was opened showed a uterus about an inch and a half in diameter, with a poorly developed musculature. The ovaries were about one-sixth their normal size, the surface was perfectly smooth, and there was no evidence of corpora lutei. There were mere vestiges of tubes on both sides.

Her convalescence was entirely without incident. The iodoform pack inserted in the vagina at operation was removed on the fourth day and replaced by another, which procedure was repeated on the sixth and eighth days. The sutures were removed on the thirteenth day, the wound healing primarily. Four weeks after the first operation the introitus was dilated under ether, and another pack inserted. She was discharged a week later, in excellent general condition.

From the patient's standpoint the result has been so satisfactory that I feel justified in reporting the case. She has been examined at intervals during the two years which have elapsed since the operation, and examination bimanually, or with the ordinary speculum, gives no hint that an abnormal condition is present. There is no contraction at any point, and the roomy area corresponding to the vagina is really surprising. She has never menstruated, and of course has never conceived, but this could not be expected, owing to the underdevelopment of the uterus and adnexa; marital relations are possible and entirely satisfactory. She has been carefully questioned at intervals as to the presence of a discharge corresponding with the active digestive process, a feature which is often reported as one of the objections to this type of operation, but she states that this has never been present.

In spite of the satisfactory results in this case, and in similar instances reported in the literature, I am still doubtful how far we are justified in advising operation for congenital absence of the vagina. I believe that there is a moral question involved in urging a patient to submit to such a radical operation. Any intestinal operation carries with it a certain mortality, and in cases where the vagina is absent, the uterus and adnexa are usually underdeveloped also, and the most successful outcome to be hoped for is that marital relations will be possible. In this particular case the risk of operation was carefully explained to the patient, but in view of her impending marriage she chose to take the chance.

After a review of the various procedures suggested for the condition, the Baldwin operation was selected, partly because it gives an opportunity to examine the pelvic organs, and to give some prognosis as to future function. The Schuehardt operation was considered and rejected. It is generally supposed to be attended with less risk to life, and there is less possibility of annoying secretions from the bowel mucosa, but the danger of fistulae is very grave, and there is serious risk of disturbance of the normal bowel control.

A NEW METHOD OF INSURING STERILITY FOLLOWING CESAREAN SECTION

BY FREDERICK C. IRVING, M.D., BOSTON, MASS.

(From the Department of Obstetrics, Harvard Medical School.)

PRESENT methods for preventing pregnancies whenever indicated following cesarean section by operation on the fallopian tubes are three in number and are all open to certain objections.

1. Double ligation of the tube and resection of the intermediate

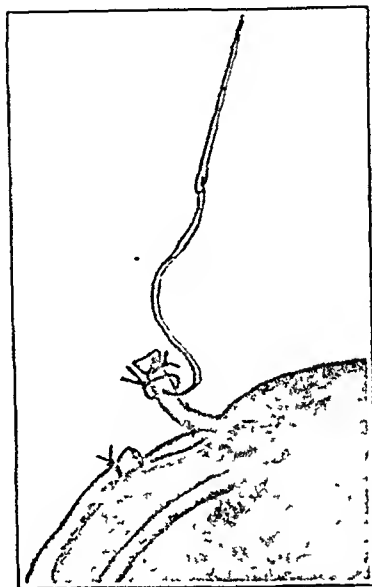


Fig. 1.—The tube is doubly ligated with chromic catgut and divided about $1\frac{1}{2}$ inches from the uterine cornu. The proximal portion is dissected free from its mesosalpinx with a sharp knife, keeping closely to the tube to avoid bleeding. Its free end just proximal to the ligature is transfixed with a long, round-pointed straight needle carrying a double suture of chromic catgut. The knotted loop of this suture is slipped over the free end of the tube and the suture drawn tight.

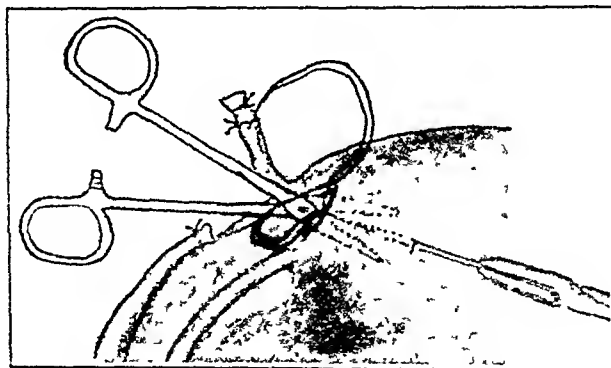


Fig. 2.—A small incision is now made in the serosa of the uterus on its anterior surface just above the insertion of the round ligament. The butt of the needle is grasped with a sharp-pointed hemostatic forceps. The point of the needle is thrust into the incision, through a portion of the muscularis and out again on the surface of the serosa about an inch from the incision. The closed hemostat, still grasping the needle, follows it into the muscularis. The jaws are spread, thus forming a pocket in which lies the traction suture attached to the tube. The hemostat is withdrawn.

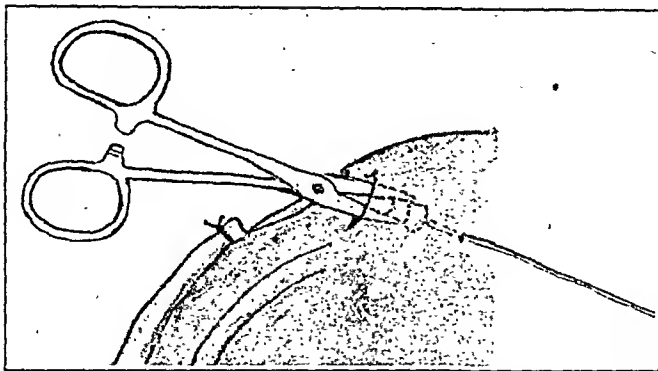


Fig. 3.—The tube end is grasped with the hemostatic forceps and inserted in the small incision. Traction on the suture causes the tube to enter the pocket prepared for it in the muscularis.

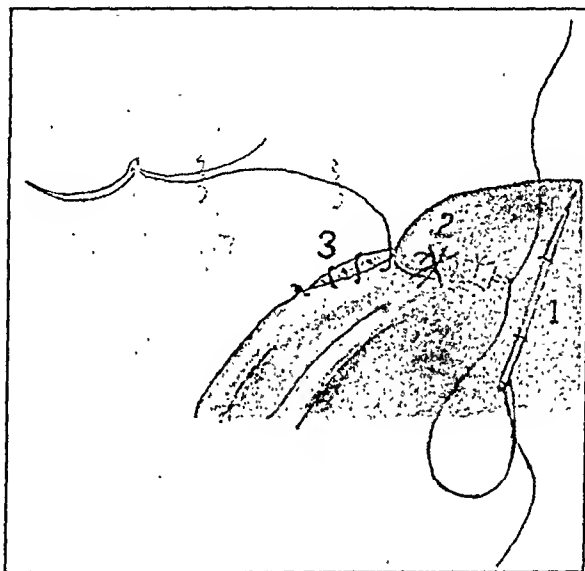


Fig. 4.—The operation is finished in the order shown by the drawing. (1), One strand of the double traction suture is cut and a stitch taken through the uterine surface at right angles to its former direction. The two ends are tied and cut. (2), The small incision in the serosa is closed by a figure of 8 suture which also provides additional anchorage for the tube. (3), The end of the distal portion of the tube is buried between the leaves of the broad ligament.

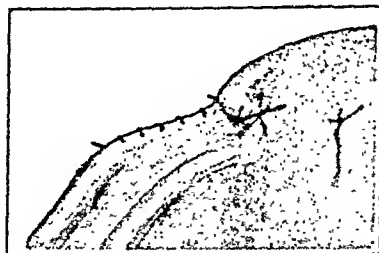


Fig. 5.—The operation is completed and all peritoneal surfaces have been approximated. As the uterus undergoes involution the buried proximal ends of the tubes become more and more compressed and should soon be obliterated. Since no time is wasted in checking hemorrhage the operation can usually be completed more rapidly than by the older method of tubal excision.

portion has occasionally resulted in slipping, premature absorption or cutting-out of the proximal ligature. Patency has thus been re-established and pregnancy has resulted.

2. Burying the infundibulum between the leaves of the broad ligament is open to the objections that the tube is not divided or even ligated and that its fimbriated extremity must necessarily be embedded somewhere near the ovary. Should the sutures used for this purpose fail to hold the wandering ovum might find no great difficulty in entering the distal end of the tube.

3. Resection of the tube with a wedge-shaped excision of its uterine insertion is the most effective method in general use today. Not infrequently, however, removal of the uterine portion is accompanied by free bleeding which may demand considerable time for its control by suture-ligature.

An ideal method should be bloodless, should include division between double ligatures and the burying of both cut ends at as great a distance from each other as possible. With this in mind I have devised the method described in the legends accompanying the following illustrations and I am now using it with complete satisfaction.

443 BEACON STREET.

A METHOD OF TREATMENT OF SEVERE TYPES OF DYSMENORRHEA WITH A REPORT OF RESULTS IN 230 CASES

BY FREDERICK A. CLELAND, B.A., M.B., F.A.C.S., TORONTO, CANADA
(*Assistant Professor of Obstetrics and Gynecology, University of Toronto*)

ABOUT seven years ago, at the Academy of Medicine, Toronto, I outlined a method of treatment for severe types of dysmenorrhea, and reported the results in about ninety cases. Since then I have continued to use the method, and have employed it in two hundred and thirty cases. My ideas have sufficiently crystallized to warrant a second report, and although I have no little temerity in proposing to this Association a method for the relief of severe dysmenorrhea, in addition to the already too lengthy list, I feel it is sufficiently easy and safe of application and satisfactory in ultimate results to recommend its use.

The pain of dysmenorrhea may begin before the commencement of the menstrual flow or at the beginning of the period; it may disappear as soon as menstruation is definitely established, may persist during the whole of the period with more or less variation in intensity; and in some cases it continues for a short time after the cessation of the flow. It is difficult to define exactly what degree of pain constitutes

*Presented as a thesis for admission to Fellowship at the Thirty-sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Philadelphia, Pa., September 19-21, 1923. The complete paper will appear in the current volume of the Transactions of the Association.

dysmenorrhea, pain being a subjective symptom. Moreover, menstruation is nearly always normally attended by a certain amount of physical, mental or local disturbance. This seems to be part of the price that our women pay for higher civilization, which has accentuated the excitability of the nervous system, for we are told that women belonging to uncivilized tribes, do not experience much discomfort at such times. The cases I report all belong to the *severe* and *obstinate* types of dysmenorrhea. They have all been severe enough to cause a greater or lesser degree of disablement, and in some cases to seriously affect the general health, and all had been previously subjected to various forms of treatment without relief.

The most prominent symptom of dysmenorrhea is pain, which in the severe cases is more acute than any pain in the pelvic region in the absence of physical signs of disease. The intensity of the pain necessarily varies, but the symptoms are sufficiently characteristic to classify the disease as an entity. Herman¹ expresses the opinion that dysmenorrhea should be described as a disease and not a symptom. The symptoms are identical with those described by writers fifty or a hundred years ago, and do not call for a long description here. The pain always begins in the pelvic region, usually in the hypogastrium, radiates to one or both iliac regions, to the sacrum, to the loins, and down the thighs. The pain at first is of a dull, aching character but it commonly becomes paroxysmal, resembling colic, and is often severe enough to cause the patient to writhe, perspire, vomit and sometimes faint. Most of my patients usually have had to remain in bed for one day, some two or three, and in exceptional cases even four or five days each month; and the pain was not relieved by lying down. With some women the spasmodic pain lasts only a few hours, but with others from twenty-four to thirty-six hours. After the acute exacerbations have passed off, the patient is left with a general soreness which persists for a varying length of time.

Many earnest investigators have, over a long period, presented countless hypotheses and theories on the etiology of dysmenorrhea and many methods of treatment have been advised, even to the point of the ridiculous, and in some instances undoubtedly most distasteful to the patient, who is usually a young unmarried woman. A review of the literature leaves an impression of confusion and one fails to find any definite or authoritative result either in the discovery of causation or an unanimous opinion as to a reasonable, safe and in-offensive treatment. One is bound to confess that all our theories and suppositions end for the most part in mere words. The bibliography is packed with extensive and often wearisome scientific speculations, but we still have no uniformly accepted explanation even of the causation of menstruation; and it necessarily follows that we

know still less of the causation of dysmenorrhea. Therefore, the treatments which have been adopted up to the present, must be regarded as almost entirely empirical. In fact we must admit that in the last hundred years the medical profession has advanced very little on this subject. It is illuminating to read old and new textbooks and old and new journals, and see what a bugbear it has long been and still is to the profession.

* * * * *

As regards treatment, undoubtedly careful attention to the general health at the time of puberty, would greatly diminish the number of cases. In some instances in which mental development has been encouraged at the expense of physical development, it is advisable to allow the girls to give up attending school for a year or so, and to spend the time in the country, as far as possible out-of-doors. If the endocrinologists are correct, this is the time that gland therapy should be employed. In addition to this it is necessary to treat suitably, any general symptoms or disease presenting, such as indigestion, constipation, chlorosis, anemia, tuberculosis, malaria, syphilis and chronic poisoning from various causes, as it is necessary to treat these conditions whether dysmenorrhea is present or not. As regards local treatment, so many measures have been tried with varying success, that it is impossible to enumerate them. Palliative treatment consists chiefly in the application of heat to the abdomen, Bier's hot air treatment, hot sitz baths, etc. Many have thought that they have found specifics for the pain in different drugs, and guaiacum resin, uzarin, nitroglycerin, atropine, sodium citrate, castor oil, chlorodyne, and all the coal tar analgesics have been vaunted at different times; and now many physicians turn to the widely advertised preparatory preparations, such as Hayden's viburnum compound and Smith's ergoapiol. Alcohol or opium and its derivatives will always relieve pain, and I am sorry to say are more frequently prescribed than one would imagine. Removal of the ovaries is an infallible remedy for dysmenorrhea, which I mention only to condemn it. The case in which it would be indicated has never come under my observation, and I do not believe it would be justifiable under any circumstances.

In 1897 Fliess¹⁴ first drew attention to what he describes as genital "stelle" or sensitive spots in the nose, and pointed out their apparent connection with certain disorders of the female genital organs. Since that time contributions have been made to the literature by several writers, including Sigmund,¹⁵ Schiff, Koblanek, Seifert and Brettaner,¹⁶ who emphasize the value of nasal treatment in some forms of dysmenorrhea. Sippel and Kuttner¹⁷ do not believe in the specificity of the so-called sensitive spots, and other writers have shown that

the application of eoeaine to other mucous membranes acts equally well. It is significant that the authors advocating the treatment have not broken silence since their first publication. In the few cases in which I have tried this method, it has proved a failure. Nor have I been able to obtain the beneficial results reported by some writers from organotherapy. I have tried most of these preparations, including ovarian extract, thyroid extract, pituitary extract, extract of corpus luteum, mammary extract and combinations of them, and the results have been quite as indifferent as those obtained from administration of iron, aloes, strychnine and manganese. Electricity has been advocated by some writers, notably Sprague,¹⁸ Lapthorn Smith¹⁹ and Goelet.²⁰ I have not tried this remedy nor have I used tampons in essential dysmenorrhea, as local applications of this kind are objectionable in young women. Recently it has been advocated to treat the tonsils or remove them, and Hernemann and Johnson²¹ recommend x-ray treatment for dysmenorrhea. I anticipate that soon someone will advocate the use of vitamins.

Although there is some merit in all this multitudinous conglomeration of ideas as to etiology, and also, we may admit, much virtue in many of the numerous remedies proposed, why not come down to a simple basis of fact? It would simplify our classification into two groups, (a) those cases in which a gross pathologic lesion is demonstrable, (b) those cases in which a gross pathologic lesion is not demonstrable, namely, essential dysmenorrhea. Our treatment would then be very much simplified. Group (a) would be treated by the removal or cure of the pathologic lesion with which the dysmenorrhea is associated. In this group would be placed such cases as reported by Rona,²² McIlroy,²³ Suekling,²⁴ Pardhy and Billington,²⁵ and Sippel. This group does not come within the scope of my paper, for these are not cases of essential dysmenorrhea. Group (b) would be treated by suitable hygienic measures, regulation of diet, habits of dress, the correction of other matters of this kind, and the administration of simple remedies to relieve the pain. But if the case did not respond and relief was not obtained and it was necessary to administer alcohol or opium and its derivatives or larger doses of coal tar products; or if the condition was of a disabling character, then more radical measures would be undertaken.

One is apt to forget what many writers have pointed out, which is undoubtedly a fact, that essential dysmenorrhea is always cured by childbirth. Women who have borne children do not suffer from dysmenorrhea unless they have had a mild infection or some gross pathologic lesion is present. And it is remarkable what various pathologic lesions may be present in women who have borne children without causing dysmenorrhea. Therefore, in bad cases of essential dys-

menorrhœa, cases which are not amenable to palliative treatment and are disabling, it should be our aim to change as far as possible the nulliparous uterus into one resembling a parous uterus, and this should be by the simplest and safest method possible.

Dilatation of the cervix has been recommended for a long time. Deweis²⁶ in 1826 reports dilating with metal bougies with satisfactory results. The technic is so simple that there are few general practitioners who have not had some experience of it. The proportion of cures which result from it have been variously estimated, but there is a consensus of opinion among the majority of general practitioners and specialists, that the relief obtained is only temporary. The patients are relieved for a few months and then pain returns as bad as ever. Instead of metal bougies, laminaria tents were popular for some years, but have been discarded on account of the uncertainty of the result and the danger of infection. To overcome the tendency to recurrence, the stem pessary has been used by many operators, and in cases in which it has been kept in position for some months, relief from pain seems to have been more permanent. My experience of the stem pessary has been limited for the reason that I feel that I have a simpler, cleaner and safer method. One case has come under my notice where, after the use of a stem pessary, such a severe infection resulted, that later a complete removal of the pelvic organs was necessary. Certain operations have been devised by Dudley, Pozzi and others, all of which are on the principle of splitting the cervix, but none of these split the internal os, and although they are often successful for sterility, they have not given great satisfaction in the treatment of dysmenorrhœa. Heywood Smith²⁷ writing in the "Lancet" in 1890, recommended dilating to No. 12 Hegar and then cutting the internal os bilaterally and inserting a stem pessary in the cervix for five days, so that the fibers would not unite; but he does not say whether he has used the method and does not report any results. Blair Bell states that in a few cases he has dissected back the mucous membrane from the anterior surface of the cervix, as is done in the first step of vaginal hysterectomy, and has severed the internal os from without inwards, and reports good results in his cases, although he does not mention any means employed to obtain a permanent dilatation.

I have come to the conclusion that no matter what may be the cause of essential dysmenorrhœa, the site of the trouble is at the internal os, and that by severing this powerful, circular, fibromuscular ring and producing a dilatation, which is maintained long enough that the muscle does not contract again, nearly all cases of dysmenorrhœa can be cured, or if not entirely cured, a sufficient measure of relief can be obtained to warrant the procedure. In the first

cases in which I severed the internal os, and did not adopt any means of maintaining the dilatation, my results were not much better than from ordinary dilatation. I then adopted the principle of firmly packing the uterus and cervix with iodoform gauze and leaving it undisturbed until the eighth day. In some cases it is not necessary to cut the internal os, as dilatation may be easily proceeded with until a sufficient degree is obtained; but in the majority when one has dilated to No. 10 or No. 11 Hegar dilators, one comes upon an unyielding band as resisting as a teething ring, as someone has suggested; the musele of the internal os is so firm and dense and almost fibrous, that further dilatation is almost impossible without risk of tearing out the volsella with which the cervix is held. It is then simpler and safer to cut the internal os than to try and divulse it. The amount of incising which has to be done varies slightly in different cases. I usually make, with a blunt pointed bistoury, two lateral incisions about one-sixteenth to one-twelfth of an inch in depth, care being taken to cut only the internal os. After this procedure, dilatation is easily continued to No. 14 or 15, according to the size of the uterus being operated upon. In the earlier cases, I dilated to No. 17 or No. 20, but this is unnecessary and may be too much. I found that although the pain was removed, a few patients had excessive flow after this extreme dilatation, and my experience has shown me that pain is quite as satisfactorily relieved by dilatation to No. 14 or No. 15, which can usually be accomplished without splitting the external os. If No. 16 or a larger dilator is used, the external os almost invariably begins to split, and I always stop the dilatation now before this occurs. As the uteri vary in size, this gives a fairly good indication when dilatation has been sufficiently carried out. Dilators of the Goodell-Ellinger type are useless for this operation, and one should always use graduated, solid dilators, so that the exact amount of dilatation may be known. Practically none of these uteri requires curettment, and I think it is a mistake to curette. If the cervix is eroded, it is lightly cauterized with a Pacquelin or electric cautery; the interior of the uterus is wiped out with iodoform gauze wrapped around a curette and immediately packed *firmly* with iodoform gauze, right out to the external os. The gauze is left long, lying in the vagina, to facilitate its removal on the eighth day. The operation is often carried out under gas and oxygen anesthesia, but sometimes gas and ether are required. *Asepsis is imperative*, particular care being taken in packing the uterus, not to allow the gauze to drag over the vulva. In none of the operations I have performed, have I had ill effects either primarily or secondarily.

In order to satisfy myself that the risk of infection is not a bar to the operation, I have, in many cases, had the gauze examined bac-

teriologically, after its removal. In most cases the gauze from the interior of the uterus is sterile, but in some, staphylococci, colon bacilli, streptococci and other organisms have been found. In no case in which bacteriologic examination has demonstrated these organisms, has there been any clinical evidence of their presence. There is usually a rise of temperature to about 99.6° or 100.2° on the second day, but this generally falls after a purgative has been given. In one case only have I had a rise of temperature which caused any anxiety. In this case the temperature rose to 102.4° on the second day, but as the patient was suffering from bronchitis, the gauze was not removed until the eighth day and no ill effects resulted. On three occasions in the early days, the incision of the internal os was made too deep, and very severe hemorrhage for a minute or two resulted, but in each case it was quickly controlled by passing a catgut suture well up in the fornix along the side of the uterus. Most of the patients have considerable pain for one or two days, the pain being of the same type as that from which they suffered at menstruation. It is usually relieved by the administration of aspirin and codeine but occasionally a hypodermic of $1/6$ gr. of morphine is necessary. I do not think that this operation can be done with impunity, but in the hands of those accustomed to operating, it ought to be as safe as an ordinary dilatation and curettage. The patient should be as carefully prepared as for a major operation, and the operation should always be done under the most rigid surgical technic.

Many of the patients have since borne children, and in no case has there been any trouble due to the previous operation; in fact most of the labors have been reported as being easy, the cervix rapidly dilating and no tear resulting. A few women have reported that at their first or later pregnancies, they have aborted, but as far as I am able to learn, no greater proportion of abortions has occurred after operation than occurs in women who have not been operated upon. My records show that I have employed the method 230 times, and I have sent out questionnaires in order that I might have accurate results to report. As the operations extend over a period of thirteen years, a considerable number have been lost track of. I have been able to keep in touch with 175 cases, and of these 138 have been either completely cured or markedly relieved, menstruation often coming on without the patient being conscious of it.

Twenty-nine cases have been partially relieved. These patients, although still suffering some pain or discomfort are able to "carry on" with or without the use of the simple measures of medical relief, and do not need to go to bed. In eight cases there has been no relief; the patients express themselves as being no better. In two cases I have performed the operation a second time. One was an

early ease, in which the cutting of the internal os and the packing of the uterus was not satisfactorily carried out. This patient has been permanently relieved by the second operation. In the second case, the patient was relieved for about eighteen months, when her pains recurred. The second operation has resulted in relief although she is not completely cured. The ages of the patients vary from 15 to 42 years. Of those operated upon, 117 were unmarried. In several cases the operation has been done at the same time as some other operative procedure, such as the removal of an ovarian cyst or an operation for retrodisplacement, a myomectomy or the removal of a chronic appendix. It is interesting to note that in two cases, a retroverted uterus had been corrected without incision of the os, with no relief of dysmenorrhea. Both of these patients were completely cured by subsequent dilatation and incision of the internal os. In a few other cases the dysmenorrhea has been associated with retroversion of the uterus, and although the retroversion was let alone, the patients were completely cured of dysmenorrhea.

Among those upon whom I have done this operation, there is a greater proportion of grateful patients than from any other operation which I perform. I recommend it for disabling cases and cases which are severe enough to require alcohol or opiates to obtain relief. It will cure or relieve practically all young women who are otherwise in good health and who look forward with dread to the recurrence of their pain each month. It is applicable to all types of essential dysmenorrhea, whether they are classified as congenital, congestive, ovarian, uterine, obstructive, neuralgie, vagotomie, spasmodic or what not. Naturally, it should be used with caution where the painful menstruation is only one symptom of an unbalanced, nervous mechanism or where some psychoneurosis is present and should be performed with as great care as if it were a major procedure. Leaving the realm of speculation, the practical gynecologist must, until further light is thrown on the subject, proceed to make use of what knowledge he has, and apply it as scientifically as possible to relieve suffering.

BIBLIOGRAPHY

- (1) *Herman*: Brit. Med. Jour., 1909, i, 937. (2) *Carstens*: Cleveland Med. Jour., April, 1913. (3) *Sippel*: Deutsch Med. Wchnschr., 1910, xxxvi, 1785. (4) *Chipman*: Canad. Med. Quart., Dec., 1919. (5) *Clarke, H. Reginald*: Cited by Chipman. (6) *Watkins*: Surg. Gynec. and Obst., 1913, p. 461. (7) *Doerderlin*: Ibid., 1914, xix, 165-168. (8) *Morton*: Am. Jour. Obst., 1914, lxxx, 215-222. (9) *Block*: Ibid., 1915, lxi, 945-952. (10) *Norak*: Jour. Am. Med. Assn., 1915, lxiv, 120-122. (11) *Bawdler*: New York Med. Jour., 1914, xcix, 962-967. (12) *Blair Bell*: Eden & Lockyer's Gynecology, 1917. (13) *Temple*: Dysmenorrhea (Read

before Academy of Medicine, Toronto, about 1884). (14) *Fliess*: Cited by Brettauer. (15) *Sigmund*: Cited by Sippel. (16) *Brettauer*: Surg., Gynec. and Obst., Sept., 1913. (17) *Kuttner*: Cited by Sippel. (18) *Sprague*: Ann. Gynec., 1891, iv, 402. (19) *Lapthorn Smith*: Am. Jour. Obst., 1891, xxvi, 161. (20) *Goclet*: Internat. Jour. Surg., March, 1900. (21) *Hernamann and Johnson*: Therap. Monatsch., 1915, xxix, 78. (22) *Rona*: Arch. f. klin. Chir., p. 968. (23) *McIlroy*: Am. Jour. Obst., July, 1913, p. 43. (24) *Suckling*: Ibid., July, 1913. (25) *Pardhy and Billington*: Discussion on Dr. McIlroy's paper; Jour. Obst., July, 1913. (26) *Deweis*: Deweis' Textbook on Females. (27) *Heywood Smith*: London Lancet, July 19, 1890.

VAGINOSCOPY IN THE TREATMENT OF GONORRHEAL INFECTION OF THE LOWER GENITAL TRACT IN INFANTS AND YOUNG GIRLS

BY L. M. RANDALL, M.D., ROCHESTER, MINN.

(From the Department of Gynecology and Obstetrics, State University of Iowa, College of Medicine, Iowa City, Iowa)

THE diagnosis, treatment and determination of cure of gonorrheal infection of the lower genital tract in the female child is an ever present problem. Irving Stein¹ has shown the lack of unity among physicians on all three of these points. Aside from these factors the doctor is constantly confronted with the matter of proper control of the patients unless he be so fortunate as to be able to hospitalize them. The material of this clinic is drawn from the whole state of Iowa, the children being committed under the Perkins Act, which permits of hospital care and complete control of the case during the treatment and for follow-up observation, the latter in conjunction with the Social Service Department. Even under these favorable conditions the infection is often stubbornly resistant to the measures ordinarily employed in the treatment, which consists essentially of the following: (1) Douches, either internal or external, or both, depending on the extent of the infection.² (2) The above, combined with instillations into the vagina and urethra of solutions of gonocides and topical applications to the perineum. (3) The injection of a suspension of medication in paste form into the vagina.³ (4) The use of oily Dakin's solution.⁴ (5) With any of the above methods an examination of the vaginal canal by means of an endoscope before making a determination of cure.⁵

The medication used is by no means constant nor is the technic of application the same. In a fairly comprehensive review of the literature one is impressed with the fact that it is not so much what is used in the treatment but *how* the treatment is carried out. In this clinic, prior to July, 1922, numerous drugs were employed with about equal success. At that time Merenrochrome 220 (H. W. & D.) was adopted as an efficient gonocide and the best method of application worked upon.

The technic at that time consisted in douches twice a day of 1:10,000 potassium permanganate, eight quarts at a temperature of 110° F., given under low pressure and continued for ten to fifteen minutes. In cases of acute vulvitis this was limited to the external genitalia and strict cleanliness (as is the rule in all cases) observed. Where there was a demonstrable vaginitis, as soon as the acute stage had subsided these douches were given internally. In addition to the douches the patients received, once a day, six days a week, local applications. A wire speculum was inserted, the vagina dried by means of cotton pledgets and a small pack soaked with the medication inserted and left for six hours. The urethra was treated with topical applications as were the anus and ducts of Bartholin's glands.

Under this regime the majority of children responded to treatment but there remained a few patients who were resistant to this method. It was with the hope of being able to demonstrate an untreated, or poorly treated locus of infection that these patients were examined by the following methods:

The child was placed in the knee-chest position and draped with a small cystoscopy sheet. The anal region was observed for possible involvement, Bartholin's glands palpated and their ducts inspected and the urethra examined. Then, using a No. 26 Koeh model urethroscope the entire vaginal tract was carefully gone over and the cervix examined. Smears were taken from the urethra, anal region, vaginal mucous membrane, Bartholin's ducts and the cervical os. These were taken in duplicate, checked by two different workers and in the event of an uncertain diagnosis, repeated. These were stained by Gram's method, methylene blue being deemed very unsatisfactory stain for smears from the female genital tract. In taking the films cotton covered applicators were not used as it was felt that the information gained from such smears was unreliable, first, because much of the secretion was absorbed by the cotton, and secondly, even with careful swabbing the pus cells were broken up and the resulting film showed what might be considered typical organisms were they not extracellular or in a disintegrated cell mass. The applicators were then tried after moistening them with bichloride of mercury but these again were not entirely satisfactory. An ordinary medicine dropper was heated over a flame and the tip pulled out into a capillary tube of sufficient length to enable us to take a cervical film through the endoscope. Using this tube and a drop or two of normal saline an emulsion was made of the secretion which was blown out on the slide and made a very satisfactory film. A platinum loop was also used with good results.

The findings were then tabulated as the case was followed through, and the results are shown in Table I.

The ages of these children vary from 16 months to 11 years.

The source of infection, as nearly as could be determined from the relative or escort which brought the child, was innocent or accidental in all but one, number three being the result of rape.

Ten of the children had had previous treatment by us for the infec-

tion, the longest over a period of 184 days and the shortest 16. In the latter instance the child was referred to this clinic because of stubborn infection and lack of co-operation. This child and two others, Cases 5 and 9, had been treated prior to their admission to our ward.

All of the patients had positive smears on the date of first examination, from the vaginal discharge.

Previous observation of two of the girls had demonstrated maculae of Bartholin's ducts, another showed a proctitis and urethritis was demonstrated in all but two. These lesions had subsided under treatment and therefore could not be held responsible for the persistence of the disease.

The local lesions were all confined to the upper third of the vaginal tract and cervix. Vaginal erosions occurred four times and erosions of the vaginal portion of the cervix four times. The cervix was definitely patulous in three cases. Caruncular hypertrophy of the endocervix was seen twice. Definite endocervical discharge could be demonstrated three times.

The vaginal erosions were small areas which appeared to represent a superficial loss of epithelium with a reddened base covered with purulent secretion. Two patients which presented these erosions also had an endocervicitis with the eroded area directly below the external os, seemingly due to the irritating cervical discharge pouring out on the mucosa.

Erosions of the vaginal portion of the cervix was associated once with definite endocervical disease but in the other three there could be demonstrated no endocervicitis. One of these, Case II, was spastic and very difficult to treat and showed a line of demarcation in the upper third of the vagina between normal appearing membrane and a much reddened fornix with cervical erosions, showing that treatment had not reached this area. The employment of the endoscope in this instance facilitated thorough application materially.

Three patients presented patulous cervices, two being accompanied by demonstrable disease of the endocervix, but the other, Case 9, showed no gross changes in the lining of the cervical canal.

Cases 1 and 2 are of particular interest. Here the external os was patent with considerable purulent material coming from the canal. On the posterior wall of the endocervix was a reddened area about the size of a small pea which appeared much like a urethral caruncle, fiery red. Apparently this lesion corresponds to the "erosion" (ectropion) found in the chronic endocervicitis in the adult. Case 1 is of further interest because of the diagnosis of gonorrheal salpingitis in a girl of five. The history revealed that she had complained of soreness and occasional sharp pain over both lower quadrants previous to admission, hence we have reason to believe that the tubal infection was there before treatment was undertaken and that manipulation did not cause extension upward. Further this has never happened in any of the children under treatment. The diagnosis was made after carefully ruling out other conditions, realizing that this complication of gonorrhea in a person of this age is rare. The perineum showed no evidence of involvement and a carefully made rectal examination caused no discomfort until pressure was made over the tubal

TABLE I

No.	AGE	HOUSE NO.	DURATION OF IT PRIOR TO EXAM	FILM ON EXAM	LOCAL LESIONS	COMPLICATIONS	DURATION OF TREATMENT FOLLOWING EXAM	SIX WEEKS FOLLOW-UP EXAMINATION	FOURTEEN WEEKS FOLLOW-UP EXAMINATIONS	REMARKS
1 G.S.	2	51451	in days 149	+	Endocervicitis Patulous cervix Cervical "Caruncle"	None	in days 33	No local lesions Cervix patulous and clean No discharge Film negative	Same as six weeks Examination	Infected in an epidemic
2 A.S.	5	51763	88	+	Cervical erosions Patulous cervix Cervical "Caruncle" Endocervicitis Vaginal erosions	Salpingitis	37	No local lesions Cervix clean No discharge Film negative	Same as six weeks Examination	History of abdominal pain before admission
3 D.D.	11	53130	16	+	Endocervicitis Vaginal erosions	None	63	Report from local M.D. Smear negative No clinical evidence	Moved from State	
4 H.S.	5	53005	82	+	None	None	31	Negative Film negative	Same as six weeks Examination	Infected from Aunt. Sister also diseased
5 L.D.	7	52674	39	+	Cervical erosions	None	42	No local lesions No discharge Film negative	Slight vaginal discharge Film negative	
6 D.R.	16 mos	52540	43	+	Vaginal erosions	Inguinal Adenitis	51	Report from local M.D. Film negative No clinical evidence	Same as six weeks Report	Infected from Mother
7 V.B.	1	47009	184	+	Vaginitis	None	37	Slight vaginal discharge No local lesions Film negative	No vaginal discharge No local lesions Film negative	Infected from Mother
8 S.S.	9	53001	82	+	Cervical erosions Patulous cervix	None	31	Cervix patulous No discharge No local lesions Film negative	Same as six weeks Examination	Infected from Aunt. Sister also diseased

TABLE I—CONT'D

9 G.B.	7	52124	60	+	Vaginal erosions	None	41	No local lesions No discharge Film negative	Same as six weeks Examination
10 J.W.	8	50307	123	+	Vaginitis	None	36	Slight vaginal discharge No local lesions Film negative	No local lesions No discharge Film negative
11 W.D.	3	52025	102	+	Cervical erosions	None	31	Right Bartholin gland duct inflamed Pus draining from the duct Typical organisms dem- onstrated in film Anal region negative— Cervix patulous	

region. This caused the child to cry out with pain from palpation on either side. The tubes could be distinctly felt and traced from the uterus toward the pelvic wall where the tenderness was the greatest.

The complications in this small series are few. Aside from the salpingitis there being only one, Case 6 which had an inguinal adenitis which did not suppurate and receded under appropriate treatment.

Subsequent Treatment and Management.—The child was placed in the knee-chest position, a small nasal speculum introduced, the vagina ballooning out with air, and the canal dried as thoroughly as possible with cotton pledgets. The endoscope was then inserted and invariably the fornices would be found moist. With this instrument in place cotton pledgets absorbed the secretion in the upper third of the vagina. A stream of warm air was then played over the entire tract, including the introitus for ten to fifteen minutes until the epithelium presented a glazed appearance. The Mercurochrome was then painted over the mucosa and the child put to bed in the Sims position for an hour. Vaginal, cervical and endocervical lesions when present were treated twice a week with a 5 per cent solution of silver nitrate. The above was supplemented with douches twice a day of potassium permanganate 1:10,000, 110° F., using about eight quarts of fluid under low pressure for fifteen minutes. This regime was carried out six days a week, no treatment on Sunday and on Monday morning before any treatment had been given, the films were made. When a negative film, together with definite clinical improvement, was obtained, the case was given local applications three times a week. If, under this management, the films continued negative and clinically good progress was noted for three weeks, treatment was suspended entirely and the child observed for ten days, taking films every other day. Following this the patient was dismissed for six weeks under supervision of the Social Service and care of the doctor referring the case. At the end of this time they returned for two days of observation, and if again found to be negative they were returned home with instructions to report in eight weeks, standing orders being that at any time symptoms were noted the child was to be returned to us.

The average duration of treatment of these eleven cases following the institution of the above regime was 39.3 days, longest 63 and shortest 31 (which was the shortest possible time if we were to live up to the above rule).

The results of the follow up are shown on the Table.

Case 7 was returned to us from an institution because of positive smears taken the day the child was returned to them. No treatment was given on readmission and daily films were taken in duplicate and gone over very carefully by several different workers. No gram-negative intracellular diplococci were found at any time. Very slight vaginal secretion was evident, the films showing many epithelial cells and extracellular organisms which occasionally stained gram negative and were proved culturally to be staphylococci.

Patient 11 returned eight weeks after the initial dismissal with a palpable right Bartholin gland which on pressure yielded pus from the duct, film showing typical gonococci. Moderate vaginal discharge was present, no erosions found in the vagina or vaginal portion of the cervix and no discharge evident from the cervix. Films from all other sources in the genital tract, the urethra and anus failed to show gonococci. The social service reported the home conditions as "filthy" and the child's hygiene was obviously much neglected judging from her condition on return to us. The possibility of reinfection is to be considered here, particularly as the rest of the genital tract showed no evidence of the disease.

CONCLUSIONS

1. Eleven children with intractable gonorrheal infection of the lower genital tract are reported in which positive films were found after clinical examination by the ordinary methods could not demonstrate a cause for the persistence of the infection.

2. Vaginosecopy revealed definite cervical disease in five patients, two of whom presented ectropion of the endocervix.

3. Systematic treatment of these lesions controlled the infection in all but one, which presented an acute Bartholin gland on return.

4. As brought out by Norris and Mikelberg, the term "vulvovaginitis" does not cover the extent of infection in many cases of gonorrheal infection in the lower genital tract in female infants.

5. Evidently the choice of medication is not of as much value as the selection of the treatment method.

REFERENCES

- (1) *Stein, Irving*: Surg. Gynec., and Obst., January, 1923, xxxvi, No. 1, p. 43.
(2) *Graves, W. P.*: Gynecology, ed. 2, W. B. Saunders. (3) *Gellhorn, G.*: Jour. Am. Med. Assn., 1920, lxxv, 1647. (4) *Norris, C. C., and Mikelberg, H. B.*: Arch. Ped., May, 1922. (5) *Norris, C. C.*: Keene's Surgery, vol. 8.

AN OVARIAN CYST OF UNUSUAL SIZE REMOVED UNDER LOCAL ANESTHESIA

BY EMERSON L. STONE, M.D., NEW HAVEN, CONN.

From the Department of Obstetrics and Gynecology and of Surgery, Yale School of Medicine.

A WHITE married woman of forty-nine years entered the New Haven Hospital on March 31st, 1922, with a complaint of "dropsy."

Her illness dated from the menopause, five years previously, when a gradual diffuse abdominal distention began. No associated symptoms occurred until one year before admission when there were mild transient attacks of palpitation and of dyspnea, and a slightly increased urinary output. Except for a tendency toward constipation, there were no symptoms referable to the gastrointestinal tract. The patient was employed as a factory worker until the month prior to admission, at which time a sudden increase in the size of the abdomen and of the lower extremities forced her to stop work. During the last week of this period, the legs were said to exude a foul smelling fluid.

The personal and family history were entirely negative. The menses had always been normal, and the one pregnancy, twenty-six years before, resulted in a difficult full-term delivery. There had been no previous operations or serious illnesses.

Upon the first examination, the temperature was 97°, pulse 115, and the respiratory rate 28. There was a notable degree of emaciation, but the positive findings upon physical examination were largely limited to the thorax and abdomen. The chest was distinctly asymmetrical, bulging on the right side anteriorly, and on the left, posteriorly, while there was a distinct vertical shortening from the upward pres-

sure of an abdominal tumor. There were many distended veins in the anterior thoracic wall, and these evidently drained into a large vessel in the first intercostal space near the left sternal border. The dorsal spine showed a lateral curvature but no signs of intrinsic disease.

The heart sounds were clear, but slightly diminished in intensity, and an occasional extrasystole could be made out. Breathing was accelerated but there were no râles.



Fig. 1.—Anterior aspect of abdominal wall. Note the striking difference in the character of the skin above and below the umbilicus. The emaciation of the arms contrasted with the edematous thighs is notable. The size of the tumor is better appreciated by the fact that two beds side by side were requisite for the patient's comfort.



Fig. 2.—The symmetrical and regular outline of the abdomen is here demonstrable but the size is relatively diminished by a lateral flattening.

Complete blood counts were within normal limits except for a leucocytosis of 11,200 and the Wassermann reaction proved negative.

The abdomen showed an extreme degree of distention, roughly oval in shape and measuring 109 cm. laterally from the bed margins (Fig. 1). The vertical dimension from xiphoid to symphysis was 98 cm. (Fig. 2). The tumor was elastic in consistency and neither tenderness nor pulsation could be demonstrated. A distinct fluid wave was felt in all areas, but because of the patient's inability to

move, shifting dullness could not be determined. The percussion note was everywhere dull except over a narrow longitudinal area on the left side, where the tympany of the descending colon was present. The skin of the abdomen presented the shiny appearance characteristic of overstretching, and in the upper half there were many large, tortuous veins, continuous with the superficial thoracic vessels described. The skin below the umbilicus was thickened, edematous, and corrugated.

The upper extremities showed marked emaciation and muscular atrophy, but the legs were extremely swollen and reddened, with many small abrasions, from which a serous fluid was exuded. The ankles, feet, and toes were included in the diffuse edematous reaction.

Pelvic examination revealed that the surface of the lower pole of the tumor was multinodular. The renal function test with phenolsulphonephthalein showed an output of forty per cent in two hours. Barium enemata were negative to radiographic examination.



Fig. 3.—Five weeks after operation, the abdomen has resumed the normal contour, and the redundant skin is easily kept in place by small adhesive strips.

A tentative diagnosis of an ovarian cyst was made, and after several days of observation and study, an exploratory incision through the lower left rectus was performed under novocaine anesthesia. The cyst wall was found adherent at this point to the parietal peritoneum. Through a small opening a clear straw-colored fluid escaped and during the next half hour forty liters of fluid were removed with but little perceptible diminution in the size of the tumor. The tentative diagnosis having been confirmed, a radical operation at an early date was decided upon.

Through Dakin tubes sutured into the incision, twenty-six more liters of fluid drained away during the succeeding twenty-four hours. A preliminary analysis of this fluid showed a neutral reaction, a specific gravity of 1.012, a heavy cloud of albumin; and upon microscopic examination many cholesterol crystals and degenerated polymorphonuclear leucocytes were seen.

Approximately three weeks later, the radical operation was performed. The

abdominal wall was infiltrated with 0.5 per cent novocaine along a line extending from the left inguinal ligament to the corresponding costal margin. Following the ligation or the digital separation of adhesions, the tumor, which had its origin in the left ovary, was delivered intact through the incision. The pedicle was divided and all bleeding points were secured in the usual way.

Saline solution was poured into the abdominal cavity, and the incision was sutured without resection of the redundant parietal wall. A firm pressure bandage was applied as a prophylactic measure against the development of paralytic ileus. The patient left the operating room in good condition, the blood pressure having dropped from 125 to 90, systolic, and the pulse having risen from 110 to 145 in a period of one hour and forty minutes.

The postoperative course was notably free of complications. The patient sat up on the tenth day, was allowed out of bed two days later, and within two weeks the wound had completely healed (Fig. 3). Thirty days after operation the patient



Fig. 4.—Section through the cyst wall including several daughter cysts. The epithelial lining of the larger cyst is flattened as a result of pressure. The lining cells of the smaller cysts are of the high columnar type with the nucleus at the base of the cell.

was discharged in excellent condition, except for the laxity of the abdominal wall, which was secured by adhesive straps.

Subsequent examination of the tumor revealed a multilocular ovarian cyst weighing sixty-seven pounds, which measured $128 \times 108 \times 35$ centimeters on a flat surface. A thinned-out fallopian tube thirty-five centimeters in length traversed the lower and posterior aspect. Several daughter cysts, measuring one to seven centimeters in diameter, were visible at one point. The contents of these smaller sacs were of gelatinous consistency, and abundant in cholesterol.

Upon section the cyst wall varied from one to three millimeters in thickness, and at certain points calcified plaques were demonstrable. Histological sections, taken through the thicker portion of the wall (Fig. 4) showed a predominance of fibrous tissue with an occasional strand of muscle. The epithelial cells lining the larger cysts were somewhat flattened as a result of pressure. Those of the smaller

daughter cysts were of the high columnar type with the nucleus at the base of the cell. At numerous points beaker cells were demonstrable.

The cyst contained fifty-seven liters of fluid. A chemical analysis by Dr. Robert Kapsinow gave the following results per 1000 c.c.

Color	Cloudy amber	Creatinine	None present
Sp. Gr.	1.025	Creatin	None present
Reaction	Distinctly alkaline	Sugar	None present
H ₂ O	95.4 - 95.7%	Chlorides	66.7 grams
Solids	4.3 - 4.6%	P ₂ O ₅	5.0 grams
Ash .....	.3 - .9%	SO ₄	3.2 grams
Organic matter	3.7 - 4.0%	Cholesterol	Trace
Total	6.12 grams	Cholesterol Esters	Trace

It is interesting to note that the forty liters of fluid removed at the preliminary operation plus the twenty-six liters which drained away subsequently and the fifty-seven liters removed with the intact cyst at the time of the later operation, represent a total fluid production of one hundred and twenty-three liters. This total no doubt was secreted over a considerable period of time, but from the figures the tendency toward rapid accumulation over a short period under favorable conditions is evident.

The literature upon ovarian tumors is most comprehensive, and many excellent texts by experienced writers are available. Furthermore, these lesions and the results of their treatment are frequently so striking and spectacular that the subject abounds in case reports of varied interest and significance. On that account data relating to additional cases are justified only when they render a distinct contribution to the subject, or represent a definite epoch in its development. This case represents a common type of tumor, much smaller than many heretofore reported, but so far as we can find, is the largest tumor of its kind removed intact under local anesthesia. Although not universally applicable, this case demonstrates the value of the method in selected instances where the general condition of the patient contraindicates the administration of a general anesthetic.

AN IMPROVED HEAD STETHOSCOPE FOR THE HEARING AND COUNTING OF FETAL HEART TONES

BY FREDERICK H. FALLS, M.S., M.D., AND THEODORE A. HUNTER, B.M.,
IOWA CITY, IOWA

THE use of the head stethoscope for the hearing and counting of fetal heart tones dates back to March, 1917, when Hillis¹ published his description of the first instrument of this kind. The advantage claimed for this instrument was that the obstetrician could listen to the fetal heart tones repeatedly while wearing sterile gown and gloves without contaminating his hands by adjusting a stethoscope or being forced to rely on second hand information as to the rate and character of the fetal pulse obtained by an assistant.

Shortly after this instrument was devised it was modified by De Lee² slightly and an attachment was made for the clocks in the delivery rooms of the Chicago Lying-In Hospital which rang a bell every fifteen seconds loud enough so that it could be heard by the obstetrician when the head stethoscope was adjusted and the heart tones being counted.

In this way the rate of the heart tones could be accurately determined without observing a watch as is ordinarily done when taking the pulse.

There are several objections to this method of timing the fetal heart beat. First, the clocks are rather expensive and cannot therefore be installed in all delivery rooms. Secondly, they are mechanically imperfect and not infrequently get out of order. Thirdly, their use is somewhat restricted by other noises in the room and this is especially true when the patient is noisy in the second stage. Fourthly, it cannot be used in the patient's home or in the delivery room not provided with the special bell-ringing device.

Some of these objections can be obviated by calling in the services of a second party who counts the movements of the obstetrician's finger as he beats time while listening to the fetal heart for a quarter or a half minute. The information as to the fetal rate is then relayed to him.

Since undertaking the amplifying of the fetal heart tones by means of the microphonic stethoscope we have become interested as well in the improvement of the ordinary head stethoscope. It is obvious that even with successful amplifying instruments that relatively few delivery rooms will be equipped with this apparatus for some time to come.

Therefore, a transportable instrument that could be worn while operating, which would give the obstetrician accurate first hand information concerning the rate and quality of the fetal heart would be very desirable.

After some experimentation we have devised two types of instruments which we believe overcome the objectionable features of the ordinary head stethoscope mentioned above. In developing the first instrument we took a head stethoscope of the ordinary spring steel type and mounted a stop watch in the middle of the longitudinal band which fits over the crown of the head. At the posterior extremity of this band we mounted a small flash-light cell. We then placed a small flash-light bulb just posterior to the transmitter bell of the instrument so that it was just above the level of the eyes when the stethoscope was adjusted for use.

We then bored through the crystal of the stop watch and passed a fine copper wire connected with the above-mentioned battery through the hole in such a way that contact was made with the hand of the watch when running. In this way contact was made by the alternate ends of the hand of the watch every fifteen seconds. The contact closed the circuit and caused the flash-light to light up for about a second.

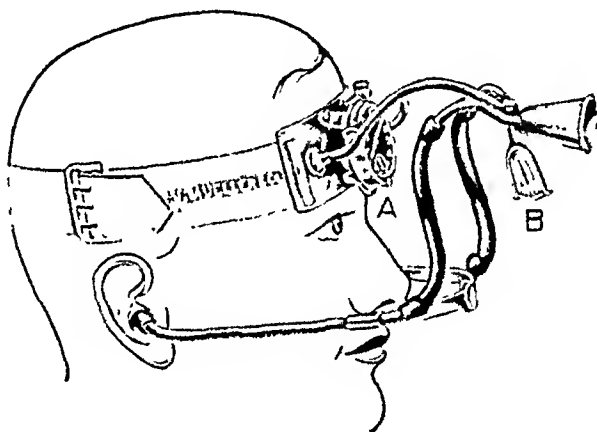


FIG. 1.—A, Watch; B, magnifying mirror.

Since a stop watch of the nonmagnetic type was used no difficulty was encountered in having a current flow through the watch.

The obstetrician has, therefore, merely to adjust his stethoscope, set the watch going, start counting with the first flash and stop with the second in order to get the rate for a quarter minute. The watch will run for several hours and the amount of current used is negligible.

The results obtained with this instrument have been perfectly satisfactory, but because of the complexity of the connections and the possibility of various parts getting out of order, a second instrument was devised.

The second type of instrument depends on an entirely different principle. We took an ordinary pocket watch with a sweep second hand and attached it by a special holding bracket to the head stethoscope so that it rested just above the root of the nose when the head stethoscope was adjusted for use. A magnifying mirror was then mounted on a ball and socket joint clamped to the horizontal bar that supports

the bell of the stethoscope. The mirror was so placed that by slight adjustment a perfect image of the watch dial was obtained without straining the eyes. We found by using the mirror in this manner that we doubled the focal distance and therefore increased the ability of the eye to accommodate comfortably. When the watch was placed in the position of the mirror it was found that this focal distance was too short for the average eye.

The image revealed in the mirror is of course reversed but this interferes in no way with the counting of quarter minutes, and with a little practice there is no difficulty in telling the time if allowance is made for the mirror image.

As an added advantage the watch has a luminous dial and hands so that the fetal heart tones can be counted by the use of this instrument in a darkened room if for any reason this is desirable.

The advantage of this instrument is its simplicity, as there is practically nothing about it that can get out of order. It provides the physician with accurate information as to the length of time consumed by any given maneuver or stage of labor. For example in a breech delivery, the physician can keep track of the time elapsing between the birth of the umbilicus and the completion of the second stage. During an operative delivery, manual dilatation of the cervix, the operator has constantly before him the time taken to dilate.

The advantages claimed for these instruments are:

1. They can be easily transported and used in the home and ordinary hospitals.
2. They can be used no matter how much noise there is in the room provided the fetal heart tones can be heard.
3. The obstetrician can get first hand information regarding the fetal heart rate.
4. With the second type of instrument the physician has constantly before him the accurate information as to the length of time consumed by any stage of labor or operative procedure.

REFERENCES

- (1) *Hillis, D. S.*: Jour. Am. Med. Assn., March 24, 1917. (2) *DeLee*: Am. Jour. Obstet., July 1, 1917. (3) *Falls, F. H. and Rockwood, A. C.*: Jour. Am. Med. Assn., Nov. 17, 1923, lxxxii, 1683.

SIX CASES OF PUERPERAL INFECTION*

By JOSHUA RONSHEIM, M.D., BROOKLYN, N. Y.

IN reporting the following cases of postpartum pelvic infection it is my intention to show that these infections are of various distinct types and may be classified as follows:

1. Endometritis,—the infection remains limited to the mucosa of the genital tract.

2. Bacteremia,—the infective organism invades the blood stream. This may be (a) directly from the placental site, or (b) secondarily from a thrombophlebitis of the pelvic veins.

3. Parametritis,—the infection spreads through the lymphatics into the parametrial tissues. A less common variety of this type is the lymphatic peritonitis.

4. Pelvic thrombophlebitis,—the infection spreads through the pelvic veins.

5. Pyosalpinx and its associated conditions, in which the infection spreads through the tubes. This type is almost invariably gonorrheal.

6. Phlegmasia alba dolens. Whether this condition is produced by an exudate in the pelvis compressing the lymphatics or whether the lymphatics forming a network around the pelvic veins are compressed by an endophlebitis of these veins is not definitely understood. Nevertheless, the diffuse white swelling of the thigh resulting from lymph stasis is a definite clinical picture.

CASE 1.—*Bacteremia by direct invasion from the placental site.* Mrs. K., a primipara, twenty-three years of age, entered my service at the Jewish Hospital on January 24, 1918, in labor. Labor terminated normally in about nine hours. A nick in the fourchette was closed with one plain catgut stitch. About 36 hours after delivery her temperature rose to 101°, and, the following morning, 48 hours after delivery, she had a chill with elevation of temperature to 103.6°. Her only complaint was of slight pain in the middle of the lower abdomen; examination showed nothing but a tender uterus. Lochia was scant. For the next 72 hours there was a gradual lowering of her temperature, then an elevation to 101° and a few hours later, following a severe chill, to 106°. Blood culture showed a streptococcus hemolyticus. Death occurred on February 4.

This is a case of septic endometritis, then invasion of the placental site as shown by the first chill, then an incubation period, finally overwhelming invasion of the blood stream.

CASE 2.—*Bacteremia following thrombophlebitis.* Mrs. S., twenty-eight years of age was admitted to my service at the Jewish Hospital at 3:45 A. M., January 31, 1923, in the third stage of her first labor. She had had a spontaneous delivery three

*Abstract of paper on "Pelvic Infections in the Puerperium," read before the Williamsburg Medical Society, Oct. 15, 1923.

hours previously; the membranes had ruptured spontaneously several days before the onset of labor. Twenty minutes after delivery, and at various times thereafter, unsuccessful attempts were made to express and extract the placenta. During all this time the patient was steadily bleeding. On admission the vulva was unshaved and the cord was protruding; uterus flabby with the fundus in the right hypochondrium; no external bleeding at this time. Heart sounds were feeble, pulse rapid and of very poor quality, respirations slow and shallow. Skin and mucous membranes showed a marked pallor and the patient constantly begged for water. She was placed in the Trendelenburg position and covered with warm blankets. The vulva was shaved and under careful asepsis the placenta was extracted manually. One c.c. of pituitrin was given hypodermically and this, coupled with manipulation of the fundus, produced contraction of the uterus. As the husband's blood did not match and as no other donor was available at that time she was given a hypodermoclysis of 1000 c.c. saline solution. At 10:00 A. M. her condition was much improved,—TPR 99—88—20. At 2:00 P. M., February 2 her temperature rose to 103° and she complained of pain in the sacral region and occipital headache. Pulse 128, heart action good, lungs negative. The abdomen was soft, uterus well contracted and not tender; no tenderness in the flanks or iliac regions, thighs, or breasts. Lochia moderate red. On February 3 her condition was the same, her only complaint being the sacral pain; her temperature was lower. At 1:00 A. M., February 4 she had her first chill with elevation of temperature to 104.8°. Blood culture was taken. Careful examination failed to reveal anything abnormal. RBC was 2,400,000; hb 45 per cent; WBC 9,200 with polys 75 per cent. Blood culture shows a streptococcus non-hemolyticus. Her condition continued the same with repeated chills and temperature ranging from normal to 106° until February 11 when her chills ceased, her temperature remained steadily high and simultaneously the laboratory reported that the blood now showed a streptococcus hemolyticus. She died on the morning of February 15.

This was a case of thrombophlebitis of the pelvic veins in a patient whose resistance had been greatly lowered by hemorrhage. Subsequently disintegration of the thrombi produced a bacteremia with its changed picture.

CASE 3.—*Parametritis*. Mrs. B. S., twenty-one years of age, a primipara was seen in consultation on May 31, 1920. She had been in labor 40 hours. She had a dystocia due to disproportion, the pelvis being normal but the baby oversized. The cervix was three fingers dilated, the membranes intact, and a vertex riding at the brim. The baby was dead. On admission to the hospital at 4:00 P. M. she was morphinized, my intention being to await full dilatation and then perforate the vertex. The following afternoon she had increased the dilatation somewhat and, in spite of my expressed desire to let her alone, one of my staff delivered her by so-called manual dilatation and high forceps. The cervix was lacerated considerably and the perineum was lacerated to the sphincter ani. There was an immediate rise of temperature to 104.4° with pain in the lower abdomen and a gradual development of a mass in the parametrial tissues of the left side. On August 17, the seventy-seventh day postpartum the mass showed a softening and bulging in the left anterior fornix and the following morning this abscess was opened and drained. For a few days her temperature showed a tendency toward normal but on August 22, following the removal of the packing strips in the cavity the temperature again rose. From this time on her condition remained stationary and on September 1 she was sent home, where her treatment was continued. On September 29 another pus cavity was drained just in front of the cervix. This resulted in a little improvement, her temperature showing a tendency to remain lower than previously, although it still showed the decided remissions. On October 18, 129 days after delivery her condition was better than at any time previously, but it was found that her urine

was now practically pure pus. The diagnosis was evident, namely rupture of a pus cavity into the bladder. She gradually improved, gaining in weight and strength. Every now and then she would have an attack of pain in the pelvis with a rise of pulse and temperature coincident with the disappearance from the urine of practically all signs of pus; this would be followed by a sudden gushing of pus from the bladder, the disappearance of all pain and return of temperature to normal. Cystoscopic examination showed enormous edema of the mucosa of the fundus with innumerable small streams of pus coming through. As the treatment produced no satisfactory results the patient was persuaded to undergo operation, especially as a mass had again developed in the left side of the abdomen with a discharge of pus from the umbilicus. Accordingly, on April 5, 1921, she was re-admitted to the hospital and operation performed on April 7. On opening the abdomen the mass in the left side was found to be in the abdominal wall, being an exudate around a sinus leading to the umbilicus. The uterus was adherent to the bladder and anterior abdominal wall; the left tube and ovary were buried in dense adhesions with marked thickening of the left broad ligament; adhesions of the right tube and ovary also but less marked. A supracervical hysterectomy was done including both tubes and ovaries; the umbilicus and its granulating sinus were excised. A rubber drain was placed in the culdesac and out through the lower angle of the wound. All the urine now drained through the abdominal wound until April 10 when, following the removal of the drain, a permanent catheter was placed in the bladder. The wound healed rapidly; the catheter was removed six days later and the patient was discharged from the hospital on May 7 in excellent condition and urine normal. She has been seen on several occasions since, her only complaint being her weight.

This is a case of infection in the lymphatics of the parametrial tissues of the left broad ligament, the point of entrance probably being the laceration of the cervix, with formation of a pelvic exudate, subsequent pus formation in this exudate, and final rupture of a pus pocket into the bladder.

CASE 4.—*Thrombophlebitis*. E. R., twenty-two years of age, a primipara, was admitted to the Jewish Hospital December 3, 1922. She was pregnant six months with a complicating hyperthyroidism. Because of her condition it was decided to interrupt her pregnancy. It is, and was then, the writer's opinion that the only way to empty a uterus at six months of pregnancy is to perform an anterior vaginal hysterotomy, but in this case the patient's physician put forth an eloquent appeal in favor of nonoperative induction of labor. Accordingly, on the morning of December 7, the cervix being tightly closed, a strip of gauze was packed into the os and the vaginal canal tightly packed. December 8 the packing was removed and it was found that it was just possible to slip the smallest Voorhees bag through. December 9 the bag was removed, having produced little, if any, advancement in the dilatation. The uterus and vagina were now tightly packed with gauze. The following morning this packing was removed and the uterus completely emptied. Instead of a clean-cut operative procedure of thirty minutes' duration the patient was subjected to repeated intrauterine manipulation over a period of four days, the natural result of which is her subsequent course. On the afternoon before the final emptying of the uterus her temperature rose to 101.4°, but dropped with the complete evacuation of the uterine contents only to rise the next day. Her temperature now continued irregularly between 102° and 105° for ten days, during which time she complained of some pain in the lower abdomen. Examination revealed a tender, boggy uterus, otherwise the pelvis was negative. On the afternoon of December 20 she had a severe chill with elevation of temperature to 106.2°; every day thereafter until December 29 she had a severe chill with varying elevations and remissions of temperature. Following her chill on December 29 she complained

of excruciating pain in the left knee which soon became the seat of a marked effusion; the next day an alveolar abscess developed which was handled by the dental surgeon. Her condition now began to improve. On January 7, after two days of normal temperature she was thoughtlessly allowed out of bed; there was an almost immediate recurrence of temperature. During the next ten days the patient was desperately ill and on January 17 in an attempt to bolster up her failing vitality she was given a transfusion of 300 c.c. of unmodified blood. There was no reaction but on the morning of January 19 her temperature suddenly dropped to subnormal followed by a severe chill, elevation of temperature to 106.4° and severe pain in the right hip. Following this attack there was decided general improvement and her temperature slowly approached normal until January 25 when she again appeared ill, although she had no complaints; this period lasted eight days. Her temperature reached normal on February 2, and, excepting one forty-eight-hour rise about the middle of February, her recovery was rapid and uneventful. She was discharged March 3. Cultures of the blood and urine were repeatedly negative. Pelvic examination on December 14 and again on January 14 was negative.

This is a typical case of thrombophlebitis of the pelvic veins with scattered embolic processes.

CASE 5.—*Phlegmasia alba dolens*. B. B., age thirty-nine, para iii, was admitted to my service at the Jewish Hospital on April 2, 1921. The vagina was packed with gauze; this had been placed there by her physician following a severe hemorrhage. She was immediately prepared and under aseptic precautions the gauze was removed and a careful vaginal examination made. A central placenta previa was found with sufficient dilatation of the cervix to permit of a Braxton-Hicks version being done. Two hours later she expelled the baby stillborn. Four days postpartum she complained of severe pain in the vulva and left side of the pelvis. She continued to complain of this pain intermittently, also of an occasional pain in the left thigh. However, nothing unusual was found until April 23 when the pain became unbearable. The left thigh was now distinctly warmer than the right, although no swelling could be made out. By the 26 of April the thigh was enormously swollen, glossy white, and extremely painful and tender. Gradual improvement. Blood transfusion April 30. On May 6 she complained of severe pain in the vulva; the right labium was swollen and extremely tender; two days later the right thigh was involved. The pain was so intense as to require morphinization for days at a time. By the 11 of May her pain and swelling were markedly lessened and she was discharged on May 27. Pelvic examination early in July showed a pronounced thickening in the left broad ligament.

CASE 6.—G. T., age twenty-two, was delivered by me on June 11, 1912. Examination on July 12 showed a normal pelvis. During the latter part of her pregnancy her husband contracted a gonorrheal urethritis. On August 7, three days after their first indulgence in sexual relations, she came to the office suffering severe colicky pain in the left side of the lower abdomen with temperature of 102.8°. The night before she had had a slight amount of vaginal bleeding. Examination showed a typical tumor in the left side of the pelvis and smears from the cervix were reported positive. Under appropriate treatment she improved until August 27 when the attack was repeated on the right side. Her subsequent course was uneventful and she was discharged September 9. Examination six months later showed a normal pelvis.

A case of gonorrheal infection involving first the left tube and then the right tube with apparently no untoward results.

The differential diagnosis is usually not difficult. In septic endometritis, a chill and moderate elevation of temperature and pain in the region of the fundus; a large, boggy and tender uterus; profuse, bloody, and distinctly malodorous lochia (unless there be retention); and rapid improvement under appropriate treatment make the diagnosis clear.

The bacteremias are ushered in with a severe chill and rapid elevation of temperature. No further chills occur; the temperature remains uniformly high. The pulse is rapid and thready. Headache, extreme weakness, inability to sleep, euphoria, and mental confusion make up the picture and the laboratory confirms the diagnosis.

In the parametritis the onset is usually late, no distinct chill, moderate elevation of temperature, pain and tenderness on one side of the pelvis. Examination reveals a mass of varying size, usually limited to one side of the uterus, cervix and vagina in the pelvic connective tissues, the region of the bladder and culdesae are free. The mass is immobile, hard, somewhat tender, and is continuous with the uterus; the exudate broadens toward the pelvic wall in contradistinction to intraperitoneal tumors. Blood culture is sterile.

Thrombophlebitis is characterized by its violent onset, the chill being severe and lasting up to thirty minutes or even longer. The repeated chills, extreme variations in temperature, and the profuse sweats are characteristic. Pain is low down in the back. The pelvic examination is negative, as the condition is entirely within the veins. Later the embolic processes are typical. Blood cultures will usually give positive results if specimens of blood are taken at the time of the chill.

The gonorrheal tube is characterized by absence of chill, moderate temperature with remissions suggestive of pus, pain is of a colicky, sticking type. Vaginal examination reveals the typical tender sausage-shaped tumor. If pelvic abscess occurs the culdesae bulges, there may be retention of urine and feces, and the mass cannot be palpated above the pelvic brim.

Phlegmasia alba dolens is characterized by severe pain beginning in the labium of the affected side and spreading to the thigh. The edema of the thigh is pronounced, while edema of the leg is entirely absent or occurs later than in the thigh. It is a lymph stasis without transudation.

205 HICKS STREET.

A CASE OF UNILATERAL AMASTIA

By HENRY W. LOURIA, M.D., BROOKLYN, N. Y.

UNILATERAL amastia is one of the most uncommon of the numerous anomalies of the breast. As the extensive literature on diseases of the breast contains only a few reports of this rare condition, it seems worth while to describe this additional case.



Fig. 1.

The patient, aged twenty-five years, sought advice on account of a gastric complaint. The physical examination revealed a frail woman, 5 feet 2 inches in height, weighing 91 pounds. As the accompanying photograph (Fig. 1) shows, there is

a complete absence of the left breast and also of the pectoralis major and minor muscles, with the exception of those fibers of the pectoralis major which arise from the clavicle. A nipple is present in the fourth interspace of the left side, slightly external to the mid-clavicular line. The nipple measures about $\frac{3}{4}$ inch in diameter and resembles a male nipple in appearance. The right breast is of average size and slightly pendulous. Examination of the left axilla shows it to be devoid of hair, except along the outer wall, where there is a large tuft of coarse hair. Over those portions of the axilla which are free from hair, the skin is of delicate texture and has but few sebaceous and sweat glands. A careful inspection of the external genitalia showed no abnormalities. The uterus was normal in size and position. No abnormalities of the adnexa could be palpated.

On account of the close relationship between the mammary glands and the reproductive system, it is interesting to review the past history of this patient as concerns these structures. Her menstrual periods commenced at the age of thirteen and occurred at regular intervals of twenty-eight days. The average duration of her periods was four to five days and the flow was normal in character and amount. She was married at twenty-one, and 14 months later she gave birth to a normal child, which was delivered at full term after a normal labor. During the pregnancy the left nipple became darker in color and slightly tender, but there was no secretion. The patient nursed the child for a period of four months, and weaned the child at this time, because she was afraid that the breast milk might become exhausted. One year following the birth of this child, the patient became pregnant a second time and gave birth at term.

This case is of interest on account of the rarity of unilateral amastia. The associated absence of the pectoral muscles has been noted in practically all the reported cases of amastia. The preservation of the nipple is more frequent than the absence of the nipple. Absence of the mammary gland and the pectoral muscles is usually attributed to an arrested development of the mammary ridge and the underlying mesenchymal mass.

149 NEW YORK AVENUE.

Society Transactions

JOINT MEETING OF THE NEW YORK AND PHILADELPHIA OBSTETRICAL SOCIETIES

NEW YORK CITY, APRIL 8, 1924

The paper of the evening was read by DR. E. A. SCHUMANN, of Philadelphia, entitled *The Relation of Venereal Diseases to Childbirth*. (For original article see page 257.)

DISCUSSION

DR. A. H. MORSE.—We all will agree that gonorrheal infection is one of the most important causes of sterility, and that there are a few cases of puerperal infection which are due to the extension upward of the gonococcus. Moreover, the work of various investigators has shown that the pathological changes which occur in the lumen of the tube as the result of gonorrheal infection, form the greatest group of predisposing causes in tubal pregnancy. It is rather interesting that in discussing this question with a Californian now an assistant resident on my staff, I learned that gonorrheal infection is common among the Japanese women living in San Francisco and that tubal pregnancy occurs frequently.

I was much interested to hear Dr. Schumann speak of granuloma inguinale because we have had under treatment for the past year a colored woman with this lesion. As far as we could determine, she had never been out of New Haven, so apparently the infection was acquired in that vicinity. She had been once pregnant, but the infection occurred subsequent to the pregnancy. One who has seen the raw surfaces with the sanguineo-purulent discharge, must agree with Dr. Schumann that in the face of such a lesion delivery by cesarean section would be the procedure of choice. The patient in question was treated with tartar emetic intravenously and the lesion gradually improved, but she left town for a period, suffered a recurrence, and is now again in the hospital.

The opinions expressed by Dr. Schumann regarding syphilis are those which are generally held. Placentae showing the characteristic syphilitic lesions come to the laboratory much less frequently now than was the case ten or fifteen years ago. In New Haven, for example, we do not see now the number of syphilitic placentae which we formerly saw.

It has been strikingly shown that the intensive treatment makes it possible for a woman to give birth to healthy living children. There is a certain number of cases in which, while the Wassermann reaction is positive, the placenta fails to show any evidence of syphilis, but it has always been my feeling that positive findings in the placenta are of greater value in arriving at a diagnosis than is the Wassermann reaction by itself. Of course, in a large percentage of cases the placental findings and the Wassermann reaction agree.

I am glad that at the end of his paper Dr. Schumann spoke of the importance in prenatal work of determining the presence or absence of syphilis.

DR. A. C. BECK.—There are a few questions which occur to me in connection with the handling of these syphilitic cases in the prenatal clinic. In the first

place, we have to rely very largely upon the results of the Wassermann examination. We find in not a very small percentage of cases that a woman may have a strongly positive Wassermann during pregnancy and that it may disappear after the pregnancy, even though she has not had treatment. We, therefore, have to ask ourselves the question of whether we are justified in treating a patient vigorously for syphilis who has no other evidence of syphilis than a positive Wassermann. In our clinic we assume that these patients are syphilitic because we cannot differentiate and have treated all of them with salvarsan and have been criticised for it.

DR. McGLYNN.—I have had perhaps a rather unusual experience with venereal diseases in pregnancy. At one hospital the majority of the obstetrical patients are of the illegitimate class. In about 650 cases, 288 showed positive smears for gonococci. In the majority of these cases the infection antedated the pregnancy. Unfortunately in this hospital we do not accept return cases, so that we have no way of following them up to know just what the ultimate results might be. We do know, however, from our experience, that it is a mistake to treat these cases during pregnancy. You only stir up the infection, and the patient instead of being benefited is apparently made worse.

Practically all these cases with the exception of six showed a decided septic type of fever during the puerperium. Many of them ran temperatures for three or four weeks, and yet were not sick. Every one of the 288 cases recovered.

DR. RALPH WALDO.—Is there any record of the paternal existence of syphilis in these cases?

DR. SCHUMANN (closing).—In regard to Dr. Waldo's question, I would say that I have records of a few cases where both mother and father were actively infected with syphilis. Those cases resulted almost invariably in the birth of dead macerated fetuses. Where both parents are actively infected at the time of conception, usually the fetus dies fairly early in the pregnancy.

In answer to Dr. Beck's query I should say that inasmuch as the Wassermann reaction is the only index we have as to the existence of syphilis, and inasmuch as we know that the modern treatment of this disease does not, if properly carried out, carry with it any danger to the woman, it would seem to be advisable (and this is done in my own practice) to treat the woman having a positive Wassermann as though she had syphilis.

NEW YORK ACADEMY OF MEDICINE
SECTION ON OBSTETRICS AND GYNECOLOGY
MEETING OF MARCH 25, 1934

DR. EDWIN W. HOLLADAY IN THE CHAIR

DR. JOHN F. McGRATH read a paper on *Inflammatory Disease of the Cervix Uteri*, a short abstract of which follows:

A general consideration of this subject is based on the study of more than 3000 consecutive gynecologic cases examined in the Cornell University Medical College Clinic. Cervical disease was present either as an entity or as an associated lesion in 61 per cent of these cases. Etiologically, pregnancy and its possibilities were the most common factors. Gonorrheal cervicitis is not to be considered as common as previously supposed. Pathologically its relation to pelvic inflammations and

puerperal sepsis was emphasized. Its prevention by better obstetrics, especially in regard to proper postpartal examinations and treatment, and the routine employment of a properly-fitted pessary was advocated, postpregnant observation extending over a period of at least six months.

Various methods of treatment were cited, preference being given to electrocauterization, the proper application of which brought about complete cure in most cases, except those associated with other pelvic pathology requiring operative treatment. The conservative treatment with cauterization is often a most necessary preoperative preparation.

When operation is indicated the Schroeder technic, modified to suit the individual case, is to be preferred because by this method one can remove as much or as little tissue as the case demands and at the same time secure better apposition of mucous membrane than by any other technic.

A plea is made for more conservative treatment of cervical disease and less surgical mutilation with especial stress being laid upon the prophylaxis of cervical cancer by early treatment of cervical inflammation.

DISCUSSION

DR. THOMAS H. CHERRY.—I should like to ask Dr. McGrath whether he cauterizes a large area or takes small areas at one time. It seems to me that the cases in which extensive cauterization has been done at one or two treatments show severe reaction with a tendency to rather violent hemorrhage. The best results in my practice have been seen in cases in which small areas have been cauterized at a treatment, and repeated in two to three weeks for a period of several months.

In reference to postpartum treatment Dr. McGrath states that he makes an examination at the fourth week and if he finds a retroversion he inserts a pessary. This seems rather early to introduce a pessary, because one is likely to stretch the cervix and the vaginal vault, and then these structures are liable to remain stretched. It seems to me that for this treatment the seventh or eighth week is a little better time.

DR. EDWIN W. HOLLADAY.—I agree with Dr. Cherry that four weeks postpartum is a little early for a pessary. As a rule we apply this measure at about the sixth week. If a pessary is introduced too early it interferes with the circulation and retards involution. I use the cautery at the end of six weeks or two months and find that as a rule one application of the cautery is all that is necessary. I cauterize deeply and then allow about a month to pass before repeating the treatment. During this period we may use a little tamponing or iodine applications. If you can accomplish the desired results with only two treatments instead of four or five, I think that is an advantage, as it spares the patient the additional discomfort.

Where operation is indicated we use extensively the Sturmdorf operation, especially in older women in whom we are not so desirous of preserving the exact anatomy of the cervix.

DR. M. O. MAGID.—Dr. McGrath stated that he used a pessary four weeks after delivery in order to promote better involution and prevent retroversion, which favors chronic congestion, without telling us that the pessary is not indicated in cases of congenital retroversion of the uterus. There are many women who have congenital retroversion. I do not see what is to be gained by the use of a pessary in these cases. In these women, having congenital retroversion, we never meet with success when we try to correct the retroversion by use of a pessary. Should they become pregnant, we find after involution is complete, that they have the uterus retroverted just as it was before they became pregnant. Dr. McGrath

enumerated the various drugs that are being used and also spoke of Strobell's treatment of endocervicitis with caustic. When Dr. Strobell read his paper, I asked him to tell us whether he had heard of any patient of his series of cases that had been delivered, but he could not give us this information. It seems to me that we follow a wrong principle to recommend a method of treatment when those who have originally advocated that method cannot give us important facts; i.e., end-results. It is wrong because many young men who take up this specialty often use these new methods of treatment to the detriment of the patient. As to the use of the cautery, if one stops to think, he will realize that in putting the cautery needle into any tissue, he always burns and traumatizes the tissue for some distance away, along the tract made by the needle. I do not see how such treatments can leave the cervix in a normal condition. Scar tissue is the inevitable result, and such scar tissue will interfere with the mechanism of the cervix at the time of delivery.

As to the Schroeder operation, it has been found to be an absolute failure. The operation does not remove the entire area of infection in the cervix. To remove the infection, the entire cervical mucosa from the external to the internal os must be removed. The Sturmdorf operation was spoken of as being particularly applicable to older women. The doctor has a wrong conception of the principles of the operation. It is not intended that the operation should be performed in older women alone, but also in women of the child-bearing period, as it is the only method of cure of the condition under discussion. I have performed this operation for about ten years and had the best obstetrical end-results in my cases.

Vaccines, radium, caustics and other methods of cure have been tried in chronic endocervicitis and found to be unsuccessful. The Sturmdorf operation is an excellent and quick way of curing this condition and the ultimate results are good. The patient does not have to be tied over seven or eight months, and, in the meantime run the possible risk of having the infection produce a certain amount of damage in the uterus, tubes, and ovaries.

DR. FREDERICK G. HOLDEN.—Those who have had no experience with the cautery may find it difficult to see how one can cauterize the cervix without some destruction of the canal, but I must say that no work that we have done has given us such a degree of satisfaction as our work with the cautery. It is possible to take a case with a cervix that fills the vaginal vault, one of those cases with a tremendous endocervicitis with nabothian cysts, and with cautery treatment to see it approaching normal in the course of a month or so, and after several months it will be practically normal except for a small amount of scar tissue. I recall one case operated upon for retroversion in which the cervix was the largest I have ever seen. The patient was going South and before she left I told her she would require an operation on her return and I gave her a few cautery treatments. She came to my office before she left and I found that she would not need the operation. She became pregnant and had a spontaneous abortion; she then became pregnant again, went to term and was delivered. This cauterization is done in the office without the use of an anesthetic. The cervix in most women is almost insensitive. It is seldom necessary to use the cautery more than once, and the cysts do not recur if they are thoroughly cleaned out. By using the cautery on a cervix that is torn and everted, using a dull red heat, the cervix inverts. We even use the cautery as early as eight weeks postpartum. If I were given a choice of only one of the various procedures used today in the treatment of endocervicitis, I would select the cautery.

As to the Sturmdorf operation, it is a good procedure. If anyone speaks disparagingly of it, the reason is that he does not know how to perform it properly. No disparaging remarks are made by those who know how to perform this opera-

tion. I prefer the cautery, however, rather than to expose the patient to the more severe operation and general anesthesia.

DR. McGRATH (closing).—Unfortunately we find that fairly extensive bleeding will occur at times, even after a mild cauterization, but this is decidedly rare. However, we very seldom get a case of severe hemorrhage and none that cannot be easily controlled. It is because of the possibility of hemorrhage and the variation in sensitiveness that I prefer to apply the cautery superficially at first; in other cases, however, I cauterize extensively where the cervix is badly diseased.

In regard to the use of the pessary, I will admit that perhaps six weeks is a better time, though I cannot conceive of any anatomical reason why it should be harmful. Dr. Holladay stated that involution was complete at six weeks post-partum. Does he include involution of the adnexae and uterine supporting elements? It is not uncommon to find involution of the uterus and at the same time relaxation and hyperemia of the vaginal walls. By the use of the pessary to restore normal anatomical relations a better circulation is promoted throughout the pelvis.

It has been my custom to allow a seven to ten day interval between cautery applications, and if one makes six or more applications the extent of the cauterization can be controlled most accurately and with less scar tissue than by making one or two extensive applications.

Dr. Magid mentioned gonorrhea as a cause of endocervicitis. The infrequency with which we find the gonococcus in cases of endocervicitis must be accepted as proof that it is not so frequent a cause as was formerly believed. Abortion, miscarriage or full-term delivery has quite often appeared as the immediate forerunner.

As to the use of the pessary in congenital cases of retroversion, many cases of congenital retroversion are not cured by the pessary but are permanently cured by pregnancy if it supervenes and if these cases are treated properly before, during and after delivery.

Concerning the caustic applications of Strobell, I mentioned this treatment not to recommend it, but because in all fairness to Dr. Strobell he is to be commended for having demonstrated the rôle played by cervical inflammation, though the treatment is probably not without danger. Most of us would be reluctant to criticize Dr. Curtis' use of radium, which is also attended with considerable risk.

The amount of scar tissue that results from the cautery applications, is necessarily problematical. We have not progressed far enough yet to say to what extent the destroyed tissue is replaced by scar tissue, though the replacement is probably at a minimum if a fine needle is used, and that is another reason why I prefer the repeated treatments: that also explains why the use of the large cautery electrode is followed by a large amount of scar tissue.

Regarding the relative advantages of the Sturmdorf and the Schroeder operations, I think Dr. Holden is impartial when he says that the Sturmdorf operation possesses great merit and that when it is properly performed it eradicates the diseased tissue. My criticism has to do only with the technic. I am of the opinion that it is impossible mechanically to draw the vaginal cuff of mucous membrane into the small opening at or near the internal os and obtain good apposition and union without excessive scar. In support of this opinion I may say that we meet cases of atresia where the operation has been performed with very exact technic. With a modification of Schroeder's operation we are able to accurately remove all the diseased area with a minimum destruction of essential cervical tissue.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

New Books

BY ROBERT T. FRANK, A.M., M.D., F.A.C.S., DENVER, COLORADO

A MOST fascinating book is Dakin's translation of Goldschmidt's "The Mechanism and Physiology of Sex Determination."¹ The author reviews the evidence gathered by biologists, and in his concluding chapter seeks to apply the data to the human race.

Some of the fundamental facts that are presented are, that bisexual reproduction is the rule in the animal world. Both the spermatozoon and artificial agents (chemical parthogenesis) result in activation of oxidation processes in the egg. The phenomena of bisexuality can be linked up with heredity and variation. The inheritance of sex corresponds to a Mendelian back cross. A physical explanation for this is found in the difference in chromosomes. Intersexuality, or sex mixture, in moths can reproduce every stage from male to female, in a predeterminable manner. This is gametal (chromosomal) intersexuality. Later in life a hormonal intersexuality (chemical) may occur. For example, in some birds the ovary exerts a repressive influence on the characters of the opposite sex. Gynandromorphism and hermaphroditism are also discussed.

This book is well worth reading by every one interested in biology, "endocrinology" and gynecology. Its strictly scientific attitude, freedom from useless speculation and objectivity is admirable and well worth contrasting—to their detriment—with the three succeeding volumes to be considered.

Gates attempts to examine the facts of human inheritance and upon these "facts" to discuss intelligent measures which may improve the human race. His discussion of Mendelian characters in plants and animals appears excellent, largely because of his training as botanist and zoologist. When he trenches upon the less well defined characteristics of *homo sapiens* he is sadly handicapped, in some in-

¹Mechanism and Physiology of Sex Determination. By Richard Goldschmidt, Director of the Kaiser Wilhelm Institute for Biology, Berlin-Dahlem. Translated by William J. Dakin, Professor of Zoology, University of Liverpool. With 113 illustrations. 1923. George H. Doran Company, New York.

²Heredity and Eugenics. By R. Ruggles Gates, Ph.D., F. L. S. Professor of Botany in the University of London and Head of the Department of Botany at King's College; Sometime Associate Professor of Zoology, University of California; Author of "The Mutation Factor in Evolution," etc., 1923. The Macmillan Company, New York.

stances, by quoting the fanciful Berman, accepting Cannon's fear-adrenalin theory without reservation, and not being able to separate the chaff from the wheat. He often fails to appreciate where writers differ according to social or political bias and therefore confuse transient social conditions with stable hereditary factors.

The book however contains much of interest, well presented.

Brown-Sequard, though a well-known scientist, allowed his "rejuvenation" to obtain unsavory notoriety. This was in 1889. Steinach, his collaborators and imitators, in recent years have done likewise. Kammerer's³ "Rejuvenation" is an appeal to the laity. He describes most graphically the reenergizing obtained by vasoligation. He claims that cancer and tuberculosis are ameliorated. In women a stimulating dose of x-ray will produce the same effect as vasoligation. The book is well written; its aim evidently is propaganda. Dr. Harry Benjamin vouches for Kammerer, Kammerer endorses Steinach. What more can you ask for?

Lorand⁴ presents another brilliantly written book for popular consumption. It is a pity that the book does not end at part two. Part one describes ten life shortening habits (I instance alcohol, sex indiscretion, anger and avoidance of parenthood).

Part two deals with the rapid ageing of women due to smoking, reduction cures, improper diet, anticonceptional practices, etc. Part three is a glorification of rejuvenation by surgical methods, organotherapy, ultraviolet light and radium baths! Would that the masterly style of this versatile author were employed in a worthier cause.

Turning now to books devoted strictly to our special branch let me call attention to Kerr, Ferguson, Young and Hendry⁵ who show the laudable intention of combining "Obstetrics and Gynecology" in one 1000 page volume in order to emphasize the intimacy and interdependence of these allied fields.

The presentation is short, direct and clear. Differential diagnosis is especially emphasized. Much of the obsolete methods of treatment still carried by textbooks has been expunged. From the text it is not possible to tell what field each collaborator has covered. The illustrations are mainly clear pen and ink sketches which necessitate more accurate drawing than is seen in some of the artistic but vague halftone reproductions now the fashion.

I cannot indorse a number of measures advocated by the authors, such as chloroform for the convulsions of eclampsia, active intervention in abortion, sea-tangle tents for cervical dilatation, "light" eurette and "disinfection" of the puerperal uterus in "sapremia" and septic endometritis, abdominal section in severe acute gonorrheal salpingitis. The conservative treatment of accidental hemorrhage by morphine and pituitrin is of interest and worth bearing in mind.

³Rejuvenation, and the Prolongation of Human Efficiency. Experiences with the Steinach Operation on Man and Animals. By Dr. Paul Kammerer. With an introduction by Dr. Harry Benjamin. Illustrated. 1923, Boni and Liveright, New York.

⁴Life Shortening Habits and Rejuvenation. By Arnold Lorand, M.D. Carlsbad, Czechoslovakia. 1923, F. A. Davis Company, Philadelphia.

⁵A Combined Textbook of Obstetrics and Gynecology. By J. M. Munro Kerr, M.D., F.R.F.P. and S., Glasgow; James Harg Ferguson, M.D., F.R.C.S., Edinburgh; James Young, D.S.O., M.D., F.R.C.S., Edinburgh, and James Hendry, M.A., B.Sc., M.B., 1923, William Wood & Company, New York, E. & S. Livingstone, Edinburgh.

Graves' Gynecology⁶ continues to prove a popular textbook. As heretofore considerable space is devoted to endocrinology, renal and rectal diseases. The arrangement continues unchanged. Graves appears to have accepted unreservedly Sampson's interpretation of "chocolate cysts" of the ovary.

The author might well omit his method of performing "anterior colpoplasty," label "Ward's method" for cystocele "Hadra's operation" if any one name is to be associated with the bringing together of the pubo-cervical fascia, and make clearer in the text that hysterectomy is not the operation of choice for prolapse. Incidentally if this book wants to remain "up to the minute," as the publishers announce, it would be well to describe Stoeckel's utilization of pyramidalis fascia flaps for the relief of incontinence of urine.

The new edition of Doederlein and Krönig⁷ as heretofore remains the most acceptable guide to gynecological operative technique. No startling changes are recorded. The surviving author, Doederlein, continues a strong advocate of the radium and x-ray treatment of cervical cancer. His five year statistics of cures in rayed cases is the same as that for patients who underwent a radical operation.

Why Doederlein fails to modify the operation for cystocele, contenting himself with the old Stoltz anterior colporrhaphy, is a mystery. In Germany Martin has described an excellent technique.

The Goebell-Stoeckel operation for urinary incontinence is beautifully illustrated. Another new operation is Bumm's collifixation for total prolapse.

Weibel,⁸ with commendable loyalty to his defunct chief, Wertheim, has written a short but most complete textbook which covers the gynecologic technique as developed at Wertheim's clinic. The book is of interest to the beginner as well as to the specialist because both elementary questions as well as minutiae of technique are dealt with. Part one deals with extirpation methods—removal of uterus, tubes and ovaries from above and below. Part two is regional and takes up vaginal plastic operations, including those for vesico-vaginal fistula, vaginal interposition of the uterus with and without shortening of the sacrouterine ligaments, and the almost obsolete recto-vaginal interposition. The radical operation for carcinoma of the cervix is especially well described. Conservative operations on the uterus and adnexa are fully dealt with.

The numerous illustrations, the strict limitations of the text to technique, the great detail given, make this book a most useful guide to the gynecologist.

Adami's David Lloyd Robert's Lecture, dealing with Charles White

⁶Gynecology. By William F. Graves, Professor of Gynecology at Harvard Medical School, Surgeon-in-Chief to the Free Hospital for Women, Brookline, etc. With 388 half-tone and pen drawings by the author, and 146 microscope drawings, with 103 of the illustrations in color. Third Edition, thoroughly revised. Philadelphia, 1923, W. B. Saunders Co.

⁷Operative Gynäkologie. Von Doederlein-Krönig. Bearbeitet von Albert Doederlein, Professor der Geburtshilfe und Gynäkologie, Direktor der Universitäts-Frauenklinik in München. Dritte Auflage. Mit 443 teils farbigen Abbildungen und 16 farbigen Tafeln. 1924, Georg Thieme, Leipzig.

⁸Die Gynäkologische Operationstechnik der Schule Ernst Wertheims. Herausgegeben von Professor Dr. Wilhelm Weibel, Primararzt an der Rudolfstiftung in Wien. Mit 299 Abbildungen. Berlin, 1923, Verlag von Julius Springer.

of Manchester⁹ is an interesting, even if biased, presentation. White evidently was a skillful, clean obstetrician who considered foul air, filthy bedding, a retention of lochia the chief cause of puerperal fever. According to the evidence presented by Adami nothing appears to show that White considered disinfection of the hands necessary. It seems justified to conclude that the horrible hospital epidemics of those times could be avoided by moderate sanitation of the wards. Collins of the Rotunda in 1826 put a stop to an epidemic by chlorinating the wards. Adami's vitriolic attack on Sir Wm. J. Sinclair, for his publication of Semmelweis' achievement, appears astonishing and quite unwarranted. What local undercurrents of Manchester medical politics inspired this attitude is a sealed chapter to me.

Two further volumes of Pfaundler and Schlossmann's *Handbook of Children's Diseases* have appeared.¹⁰

Volume two deals with infectious diseases. Among the less well-known varieties the "fourth disease," Weil's disease, epidemic encephalitis and poliomyelitis receive careful attention. Serum disease is treated in an appendix.

Volume three describes diseases of the digestive apparatus, including the metabolism of the infant, the intestinal flora and important sources of poisoning. Two hundred pages are devoted to diseases of the respiratory apparatus, and the final hundred pages treat of cardiac, vascular and lymph-glandular troubles.

The format, colored and halftone illustrations continue to be of the same exceptional quality as in volume one.

The translation of Braun's book¹¹ from the sixth German edition edited by Malcolm L. Harris of Chicago is of interest to every surgeon. One hundred and forty-three pages are devoted to introductory topics including the properties, both chemical and physiologic, of most of the local anesthetics and the factors which aid or hinder in their application. The next 60 pages are devoted to general technic, while the concluding 200 pages deal with regional application. The book is a valuable guide to local anesthesia; its value is enhanced by Harris' editorial additions. Of especial importance are the discussions of infiltration and conduction anesthesia regionally applied.

The next volume may be used as a valuable adjunct to Braun's treatise, for Finsterer's¹² *Local Anesthesia Methods*, translated by Burke, deals at great length with the abdomen. Finsterer claims that local anesthesia avoids deaths from shock even in the aged and debilitated (639 gastric and 163 intestinal resections), reduces postoperative gastric dilatation to a negligible quantity, and almost abolishes postoperative vomiting. Intestinal atony, as an operative sequel, is

⁹Charles White and the Arrest of Puerperal Fever. With which are reprinted Charles White's published writings on Puerperal Fever. By J. George Adami, C. B. E., M.D., F. R. S., Vice-Chancellor of the University of Liverpool. New York, 1923, Paul B. Hoeber, Inc.

¹⁰*Handbuch der Kinderheilkunde*. Herausgegeben von Professor Dr. M. von Pfaundler und Professor Dr. A. Schlossmann. Vier Bände mit 70 meist farbigen Tafeln und ca. 500 Textfiguren. II und III Band, Dritte Auflage mit 29 Tafeln und 260 Textfiguren. Leipzig, 1923, Verlag von F. C. W. Vogel.

¹¹*Local Anesthesia*. Its scientific basis and practical use. By Professor Dr. Heinrich Braun, Director of the kgl. Hospital in Zwickau, Germany. Translated and edited by Malcolm L. Harris, M.D., Professor of Surgery, Chicago Polytechnic, etc. Second American from the sixth revised German edition. With 231 illustrations in black and colors. 1924, Lea & Febiger, Philadelphia and New York.

¹²*Local Anesthesia Methods and Results in Abdominal Surgery*. By Professor Dr. Hans Finsterer, Surgeon-in-Chief, Vienna Hospital of the Brothers of Charity, with 42 illustrations. Authorized English Version. By Joseph P. F. Burke, M.D., Sc.D., LL.D., Buffalo, N. Y., New York, 1923, Rebman Company.

said to have disappeared since he employs local anesthesia. He warns against induction of posterior splanchnic anesthesia (by the Kappis method) except in the sitting posture and prefers the anterior route through the opened abdomen (Brann's technic). For the pelvic organs he recommends parasacral narcosis.

The book contains many valuable details of operative technic, especially applicable to the gastrointestinal tract. The smoothness of the translation could bear improving.

Paramore¹³ has written a small brochure on the toxemia of intestinal obstruction, in which he concludes that the symptoms are not due to a toxic agent but result from the increase in abdominal pressure. He also applies his theory to eclampsia.

Deluca¹⁴ offers a monograph on arterial tension and blood viscosity during pregnancy, labor and the puerperium, containing many graphic charts.

Watson's treatise on "Hernia"¹⁵ is a complete, detailed, well-balanced monograph which it is both pleasant and profitable to study.

The text is clear, the arrangement good, the descriptions are ample but not verbose. Excellent artistic illustrations by W. C. Shepard illuminate the text. The end of each chapter has a short but good bibliography. Much space is devoted to the commoner varieties of hernia, inguinal, femoral, and umbilical, but the rare varieties are fully discussed. Operative methods are very well described. This book is most worth while.

Adams¹⁶ in the second edition of the book, which first appeared written by himself and Cassidy covers all acute intraabdominal conditions from the viewpoint of the general practitioner. The volume forms a very readable elementary guide, which deals with all surgical diseases of the abdomen including gynecologic ailments. It carries no appeal to the trained surgeon.

Evans¹⁷ diseases of the breast is a strange book to appear from the University of London Press. I repeatedly looked at the title page to assure myself that the year of publication was really 1923! The great majority of literature quoted is of the last century, and much of it before 1890. This book which is meant to describe "the present state of our knowledge" has three rather crude drawings of a dissection of the axilla, but, except for numerous diagrams of skin incisions, not a single illustration of the steps of the radical operation for removal of the breast. On the other hand there are at least five full page drawings of breast bandages worthy of an elementary compend for students.

As a reference book to rare breast conditions, to the observations of

¹³The Toxemia of Intestinal Obstruction. By R. H. Paramore, F.R.C.S., Hon. Surgeon and Gynaecologist, Hospital of St. Cross, Rugby, etc. London, 1923, H. K. Lewis & Co.

¹⁴Tension Arterial y Viscosidad Sanguinea en Obstetricia. Par Dr. Francisco A. Deluca, Profesor de la Clinica Obstetrica y Ginecologia. Buenos Aires, Imprenta Mercantil, 1923.

¹⁵Hernia. Its Anatomy, Etiology, Symptoms, Diagnosis, Differential Diagnosis, Prognosis, and Operative Treatment. By Leigh F. Watson, M.D. Associate in Surgery, Rush Medical College, Chicago, Ill. 232 Original Illustrations, By W. C. Shepard. St. Louis, 1921, C. V. Mosby Co.

¹⁶Diagnosis and Treatment of Acute Abdominal Diseases, Including Injuries and Complications of External Hernia. By Joseph E. Adams, Surgeon to St. Thomas's Hospital, etc. Second Edition, 1923, William Wood and Company, New York.

¹⁷Diseases of the Breast. By Willmott H. Evans, Consulting Surgeon of the Royal Free Hospital. With 103 Illustrations, of which 15 are colored. 1923, University of London Press Ltd., London.

Astley Cooper, Billroth, S. W. Gross and other surgeons of the middle of the last century, as an atlas of colored illustrations made from rare English museum specimens, the volume has its value. As a modern treatise it is an absolute failure.

Human Protozoology by Hegner and Taliaferro¹⁸ is a thick but compact volume designed for the student, health officer and physician. The new valuable data on human protozoa obtained during the World War are here for the first time gathered. The huge material does not lend itself to review. The book is of great value as a reference handbook to all who are interested in the causation of diseases.

The most striking features of Marion and Heitz-Boyer's¹⁹ textbook of Cystoscopy and Ureteral Catheterization are the numerous and superb colored plates which give to the volume the value of a complete atlas. The description of the optics and methods of employing a cystoscope is concise and clear. A chapter is devoted to the changes due to gynecologic conditions (cervical cancer, uterine fibroid, prolapsus) and pregnancy. Much importance is attached to urethroscopy. to cystoscopic methods of bladder treatment, pyelography, functional test of the urine and blood, expulsion of ureteral stones by means of the ureter catheter, etc. This is a complete and valuable treatise.

Casper's²⁰ textbook of urology and of male sexual diseases is in its fourth edition. It covers the entire field of male genital diseases. urethra, bladder, ureter and kidney. Taken together with the second edition of his "Handbook of Cystoscopy" (1923) the two form a valuable treatise which, however, pays no special attention to the wants of the gynecologist. The newer findings relating to the nephritides, to pyelography and radiography have been added. Blood chemistry has been seriously slighted.

Montague²¹ has devoted 180 pages to pruritus ani et vulvae. He gives a good description of the pathology, which, in short, is a simple chronic dermatitis, with acute exacerbations or a final atrophy. His descriptions are often unduly detailed as for example that of the action of bromides. Many remedies, as heretofore, are advised.

Vignoli's²² manual of human embryology is an elementary book designed for the first year medical student. The exposition is clear, the diagrams are instructive and much of interest will be found in its pages. For instance, he shows that the spermatozoon has to traverse 8, 8 meters to reach the ovum!

Zieler²³ has written a short but accurate account of the diagnosis

¹⁸Human Protozoology. By Robert W. Hegner, Ph.D., Professor of Protozoology, and William H. Taliaferro, Ph.D. Associate Professor in the School of Hygiene and Public Health of the Johns Hopkins University. 1924, Macmillan Co. New York.

¹⁹Traite Pratique de Cystoscopie et de Catheterisme Ureteral. Par Professeur G. Marion et Professeur M. Heitz-Boyer, Deuxieme Edition, Entierement Refondue. Avec 60 Planches hors texte en noir et en couleurs, Paris, 1923, Masson et Cie, Editeurs.

²⁰Lehrbuch der Urologie. Von Dr. Leopold Casper, Professor Universitaet Berlin. Vierte, neu bearbeitete und vermehrte Auflage. Mit 225 teils farbigen Abbildungen und 2 farbigen Tafeln. 1923, Urban & Schwarzenberg, Berlin und Wien.

²¹Pruritus of the Perineum. (Pruritus Ani, Vulvae and Scroti). By Joseph Franklin Montague, of the Rectal Clinic, University and Bellevue Hospital Medical College, etc. With 37 illustrations. New York, 1924 Paul B. Hoeber, Inc.

²²Manuel D'Embryologie Humaine. Par J. Vignoli, Aide d'Anatomie et de Physiologie à l'Ecole de Medecine de Marseille. 196 figures, 8 planches couleurs. 1923, A. Maloine & Fils, Paris.

²³Die Geschlechtskrankheiten. Ein Grundriss fuer Studierende und Aerzte. Von Dr. Karl Zieler, Professor und Vorstand der Universitaetsklinik fuer Haut und Geschlechtskrankheiten in Wuerzburg. Mit 17 Abbildungen im Text und 1 Tafel. Zweite vermehrte Auflage. 1922, Verlag von Georg Thieme, Leipzig.

and treatment of gonorrhea, soft chancre and syphilis. This little compend is of value for the student and practitioner.

Doederlein's²⁴ pocket compend of obstetrics is now in its fifteenth edition. The authority of its writer, his huge experience as a teacher, and the numerous illustrations lend to this small volume a value far above that of the usual compend.

This second edition of Bacon's "Obstetrical Nursing"²⁵ is very satisfactory. It gives the obstetrical nurse an excellent guide to her actions, duties and obligations. As, according to the author, in exceptional instances, the nurse may be required to actively combat emergencies he instructs her how to make vaginal examinations and how to tampon in placenta previa. Let us hope that she may never be called upon to do the latter.

Josephine Baker²⁶ has had a huge experience which well qualifies her to write the three popular books "Healthy Mothers," "Healthy Babies" and "Healthy Children." These subjects are illuminatingly and tactfully treated. The first book deals with the mother from conception to the lying-in period. I would suggest that coitus be positively interdicted during the last two months, and that sponge baths be substituted in all cases during this same period for tub baths. It is hazardous to recommend a vaginal douche during pregnancy without a physician's supervision.

Healthy Babies and Healthy Children are very satisfactory, neither pedantically nor vaguely written, and therefore likely to prove of real help to parents.

In these days of new developments, rapid changes and many inventions, an up-to-date dictionary is a requisite.

The twelfth edition of Dorland's²⁷ contains 3000 new words. Special attention has been given to chemistry and to dental terms. The volume is compactly and attractively gotten up, with a thumb index to aid in ready reference.

In conclusion I desire to refer to the booklets published under the auspices of the National Health Council. They are nontechnical, destined for the lay public, sound, and written by accepted authorities. Their wide distribution can do much to educate the laity and help to crowd out some of the so-called "popular" books of information many of which are little better than advertising from motives either personal, proprietary or to advance some cult.

The following 14 little volumes have appeared:

The Baby's Health. By Richard A. Bolt, M.D., Gr.P.H.

The Young Child's Health. By Henry L. K. Shaw, M.D.

²⁴Leitfaden fuer den Geburtshilflichen Operationskurs. Von Dr. Albert Doederlein, Geh. Hofrat, Professor der Geburtshilfe und Gynaekologie der Universitaets-Frauenklinik in Muenchen. Vierzehnte und funfzehnte Auflage. Mit 173 Abbildungen. 1923. Verlag von Georg Thieme, Leipzig.

²⁵Obstetrical Nursing. A manual for nurses and students and practitioners of medicine. By Charles Sumner Bacon, J.D.B., M.D., Professor of Obstetrics in the University of Illinois and in the Chicago Polyclinic; Medical Director in the Chicago Lying-in-Hospital and Dispensary, etc. Second edition, thoroughly revised. 1924. Lea & Febiger, Philadelphia.

²⁶Healthy Mothers, Healthy Babies, Healthy Children. All three books written by Josephine Baker, M.D., Director, Bureau of Child Hygiene, New York City, etc. Boston, 1925. Little, Brown, & Co.

²⁷American Illustrated Medical Dictionary. A new and complete Dictionary of the terms used in medicine, surgery, etc. Pronunciation, derivation and definition. By W. A. Norcross, M.D., F.A.C.S., etc. Twelfth edition, revised and enlarged. Philadelphia, 1925. W. B. Saunders Co.

Personal Hygiene, The Rules for Right Living. By Allan J. McLaughlin, M.D.

The Human Machine. By William H. Howell, Ph.D., M.D., LL.D., ScD.

Food for Health's Sake, What to Eat. By Lucy H. Gillett, A.M.

The Quest for Health. Where it Is and Who Can Help Secure it. By James A. Tobey.

Taking Care of Your Heart. By T. Stuart Hart, A.M., M.D.

Cancer, Nature, Diagnosis, and Cure. By Francis Carter Wood, M.D.

Community Health, How to Obtain and Preserve it. By Donald B. Armstrong, M.D., ScD.

Man and the Microbe. Charles-Edward Amory Winslow.

The Expectant Mother, Care of Her Health. By R. L. DeNormandie.

Love and Marriage, Normal Sex Relations. By T. W. Galloway.

Tuberculosis, Nature, Treatment, and Prevention. By L. R. Williams.

Veneral Diseases, Their Medical, Nursing, and Community Aspects. By W. F. Snow.

They are published by Funk & Wagnalls Company, New York and London, 1924.

Selected Abstracts

Breast

Greig: Puberal Mammary Hypertrophy. *Edinburgh Medical Journal*, 1922, xxviii, 153.

In a girl of fourteen and a half, enlargement of the breasts was first noted two months after the onset of menstruation. The breasts were of unequal size. The left breast measured eight inches vertically by eleven horizontally. Except for a few sparse hairs the external genitals retained their infantile characteristics. Necrosis of the superficial tissues over the breast began about five months after the condition was diagnosed and the girl died soon after from a systemic extension of the local infection. Operation was not considered wise in this case because of complicating conditions. Autopsy showed the breast condition to be a glandular hyperplasia of nodular form. Microscopically the gland structures were mainly fibrous with an altered epithelium in the gland spaces. The uterus and ovaries were normal for the age.

Examination of the literature revealed only 26 verified and 20 unverified cases of puberal mammary hypertrophy. The normal increase in the female breast at puberty is more a fatty overgrowth of the envelope than a glandular ectasis, the reverse is true in pregnancy. With pregnancy excluded the common cause of progressive bilateral mammary hypertrophy is chronic mastitis. Pathologically the breast changes in puberal mammary hypertrophy resemble those occurring normally in pregnancy. A rapid change from the infantile condition of the uterus and ovaries does not accompany this condition. In physiological enlargement of the breast the stimulus comes undoubtedly from hormonal changes. Puberal hypertrophy suggests a want of control of the process stated.

Death occurring in these cases is almost without exception due to septicemia following local necrosis from defective cell nutrition. The 5 unoperated cases

in this series all died from this cause. The treatment is surgical. In 5 cases an interval of from one week to six months elapsed between the removal of the two breasts. Should there be a considerable difference in the degree of affection of the breasts, removal of the larger is justified, the other probably will atrophy. This diminution in size after unilateral amputation suggests that the hormone auto acid may come from the glands themselves. The hormone associated with puberal hypertrophy is not a galactagogue and subsequent pregnancy has been noted to produce no secretion in a breast once so affected. When by pathological overgrowth the mammary activity becomes exhausted we are left with ovaries and uterus in the prime of activity. Puberal mammary hypertrophy is a disease *sui generis* having distinctive symptoms and urgently necessitating a definite surgical procedure.

H. W. SHUTTER.

Rosenburg: Menstrual Changes in the Breast. *Zentralblatt für Gynäkologie*, 1923, xlvii, 111.

Changes in the breast incident to pregnancy have long been known, but Rosenburg draws attention to a cyclic change in the breast, notably a premenstrual hypertrophy. This alteration in the breast has been associated with the premenstrual swelling of the uterus, and has been attributed to a secretion of the corpus luteum. A curve may be plotted more or less parallel to the well-known menstrual curve of Schröder. The change in the breast for lactation does not appear to be due in any particular way to the presence of the corpus luteum of pregnancy, a matter of considerable medico-legal importance.

LITTLE.

Perkins: Supernumerary Breast on Buttock. *Journal American Medical Association*, 1921, lxxvi, 792.

A white married man of masculine development and with two normal male breasts, has a fully developed breast on his right buttock. It is the size of an orange, has a well-developed nipple and sags like a breast in a woman of his age (59). At from 17 to 33 yrs. of age, the breast secreted monthly for a few days at a time so that he was obliged to wear a pad. Beside this, the breast caused no inconvenience.

R. E. WOBUS.

Lewis and Wells: The Function of the Colostrum. *Journal American Medical Association*, 1922, lxxviii, 863.

The question as to whether colostrum is merely an intermediary stage in the production of milk or whether it has a definite function, has long been a matter of speculation. In recent years the subject has been approached in a more definite manner. From these studies the conclusion has been reached that the colostrum is a very important factor in the production of immunity in infants.

Previous investigators had established the fact that, in addition to the usual amount of milk albumin and casein, colostrum contains as much as 8 per cent of globulin. This globulin is identical with blood globulin, while milk albumin differs decidedly from blood albumin. It has been further demonstrated that when the mother exhibits a certain immunity, this immunity is not present in the infant until it has imbibed the mother's colostrum. It has also been found that the colostrum is very rich in these immune bodies, that they occur there in greater concentration than in the mother's blood and that they diminish in the mother's blood soon after parturition. It has also been found that the newborn absorb certain albuminoid bodies very rapidly. In the calf it was found that while specific agglutinins for *B. abortus* were absent at birth, they appeared in the blood half

an hour after the calf had ingested colostrum. It was also found that euglobulin, which seems associated with the immunity bodies, occurs in the calf's blood only after the ingestion of colostrum.

From a review of the literature supplemented by their own researches, Lewis and Wells conclude that the colostrum is essential in conferring immunity to the newborn and that consequently there can be no suitable substitute for human colostrum.

R. E. WOBUS.

Bedo, F.: *The Care of the Breast in Nursing Mothers.* Medizinische Klinik, 1922, xviii, 928.

The care of the breast in nursing mothers is a problem for both obstetrician and pediatrician. The affections of the nursing breast are due to three factors, wrong technique of nursing, lack of skill on the part of the mother and doctor, and uncleanness. Almost every primipara nurses her baby in the wrong way. Instead of having the baby grasp the areola, only the nipple is permitted to be compressed by the child's jaws. Continued action upon the nipple by the hard jaws produces fissures and these are the portals of infection.

Special care of the nipples during pregnancy is not as necessary as some men believe except when the nipple is small or inverted. Simple washing with soap and water and drying is sufficient.

A newborn baby should be put to the breast 6 to 8 hours after birth and should be left for only a few minutes. Leaving the child at breast too long brings about maltreatment of the nipple. Most fissures of the nipple occur during the puerperium when the patient is still in bed. In these cases it is advisable to have the patient sit up while nursing. Should the cracks occur later, when the patient is up and about, it is better to have the patient in a reclining position when nursing the baby. The change of posture will prevent the child from touching the tender areas with its gums. Locally alcohol should be applied and also a solution containing tannic acid (1.0), anaesthesin (0.5) and glycerin (10.0). This is permitted to dry and a gauze dressing applied. When the breast is hard and tender and masses are found, it is essential to forcibly empty the breast before each nursing with the Bier pump. In the presence of pus, surgical measures are taken but the bandage should be so applied that the child will be able to nurse.

J. P. GREENHILL.

Dorman and Mossman: *Puerperal Mastitis.* Journal American Medical Association, 1921, lxxvii, 509.

In 2000 consecutive patients delivered at the New York Woman's Hospital there occurred 57 cases of mastitis or 2.8 per cent. Observations at this institution support the contention of De Lee that infections of the infant are an important etiological factor. Infections usually occurred in the second week postpartum. The number of breast abscesses was 0.4 per cent.

Among prophylactic measures, the authors believe that cleanliness is of first importance and that, in the case of depressed nipples, massage is advantageous. After delivery, they advocate nursing periods of from three to five minutes at from four to six hour intervals until the milk appears. For damaged nipples they use tincture of benzoin or bismuth and castor oil, or the nipple shield. In the interval the nipples are protected by a gauze pad held in place by adhesive strips. They think this dressing has decreased the number of cases under their care. Accepting the use of the binder, catharsis, the limitation of fluids and the ice bag, they believe the breasts are best emptied by the infant until suppuration sets in.

Massage and pumping may supplement nursing but must be carefully employed.

In case of suppuration, heat is applied, nursing and breast manipulation are stopped, free incision with counter drainage is instituted and the cavity irrigated with Dakin's solution.

R. E. WOBUS.

Temesvary: The Treatment of Puerperal Conditions of the Breast with Light. Zentralblatt für Gynäkologie, 1923, xlvii, 1513.

The writer has made use of the Engelhorn lamp in certain cases of parenchymatous mastitis, and reports favorable results in three cases. The application lasted from forty minutes to an hour and a half, though in one case there was a small burn from a sixty minute exposure. In general it seems advisable to radiate the nipple alone, which apparently results in mild lessening of the pain. The cure is probably biological, produced by the factor of light and heat.

LITTLE.

Baer: Breast Infections: Surgery, Gynecology and Obstetrics, 1921, xxxii, 353.

In the Michael Reese Maternity from Jan. 1, 1917, to Oct. 1, 1918, there was a total of 2,323 cases with 5 cases of breast abscess. From Oct. 1, 1918 to Dec. 1, 1919 there were 1,212 cases with 17 breast abscesses. It was surmised that the influenza epidemic might be responsible for this increase. Baer, therefore, sent a questionnaire to 29 other maternities of which, however, only two had noted such increase. The questionnaire covered a number of other points and showed, e. g. that the methods used for preventing and treating breast abscess are very similar in most lying-in hospitals.

R. E. WOBUS.

Nürnberg: The Complications of Puerperal Mastitis. Deutsche Medizinische Wochenschrift, 1922, xlviii, 354.

While the prognosis of puerperal mastitis is usually favorable, Nürnberg calls attention to the fact that it may give rise to various complications and may even be followed by death. Among the complications which have been encountered by himself and other observers he mentions metastatic abscesses in various parts of the body, parotitis, thyroiditis, endocarditis and pericarditis, pleurisy, osteomyelitis and infections of the kidney and of the liver.

The treatment of these complications will vary with their nature. Surgical lesions usually require drainage. Nürnberg thinks that vaccines and injections of some of the casein preparations should be used in all cases, even in early cases of mastitis. In the latter instance, he feels that the process may be shortened or, if used very early, the infection may be checked completely.

R. E. WOBUS.

Grynfeldt, E., and Tzelepoglou, C.: The Galactocoele: Gynécologie et Obstétrique, 1922, v, 105 & 204.

The authors conclude that the galactocoele is not a disease entity but that it is a secondary condition arising from various pathologic states of the mammary gland. Anatomically they distinguish: ectatic galactocoele, interstitial galactocoele, adeno-galactocoele, and pyo-galactocoele. They think the conditions arise: (1) From inflammatory affections which give rise to varying anatomic conditions depending on the intensity, location, etc. of the inflammation; (2) From traumatism resulting in rupture of the lactiferous ducts. The authors found that the adeno-galactocoele was the most common form. The anatomic pictures were quite complex and one might speak of mixed galactocoeles. They think that the clinical course varies with

the anatomic type and that the treatment differs with the different varieties. Puncture, incision, or excision may be indicated.

F. L. ADAM.

Sistrunk: Cancer of the Breast with a Study of the Results Obtained in Two Hundred and Eighteen Cases. *Pennsylvania Medical Journal*, 1921, xxiv, 781.

The report covers the follow up work on 218 of the 246 cases of breast cancer (all women) operated at the Mayo Clinic in 1911, 1912 and 1913. Investigators have shown that the lymphatic chains from the breast drain into the subclavicular region, the opposite axilla and under the sheath of the rectus muscle as well as into the corresponding axilla. In the technic employed both pectoral muscles, a portion of the upper rectus fascia, the subscapular and axillary lymphatics were removed.

Extension present at the time of operation gave the key as to prognosis. Sixty-four per cent of the 86 patients without and 19 per cent of the 132 patients with primary gland involvement are alive five to eight years after operation. Sixty and one half per cent of the patients had primary gland involvement. In women with gland involvement, the outcome was twice as favorable after the menopause as before, 24.6 per cent and 12.7 per cent respectively being alive. Because of the subsequent increase in lymphatic supply to the breast incident to pregnancy, the prognosis in parous women was less favorable. Two cases pregnant at the time of operation have died since. Four patients still lactating when operated have all died in the five year period. Ulceration is a bad prognostic sign. Tumors attached to the skin were usually superficial. The highest percentage of cures was obtained in tumors of the upper inner quadrant, the lowest in the lower inner quadrant.

Of the 97 patients where the location of recurrence was ascertainable, local, or local involvement plus metastasis occurred in 47.4 per cent. Of the cases operated for cancer of the breast, metastasis occurred in the chest in 9.6 per cent, the bones 7.8 per cent, the abdomen in 5 per cent, the brain 1.4 per cent and in the opposite breast in 2.7 per cent. Fourteen out of 17 cases of bone metastasis occurred in the spine. In 81 per cent of 104 cases the cause of death is known. The primary operative mortality was 4 per cent. Eleven women died from causes other than recurrence. Fifty-five per cent of the total number of cases were dead at the end of five years. Two and three tenths per cent died later. At the end of five years 65.1 per cent of the cases without primary gland involvement were alive. When followed by the radical operation the results obtained by simple removal of the tumor for diagnosis are not necessarily bad, provided the tumor is not cut into during its removal. The author feels that little progress is to be made by changes in technic. With early treatment 75 to 80 per cent of the cases are curable.

H. W. SHUTTER.

Handley, W. Sampson: Lines of Advance in the Surgery of Breast Cancer. *British Medical Journal*, Jan. 8, 1921, 37.

The author emphasizes the importance of avoiding incomplete operations for cancer of the breast. He doubts the possibilities of extending the complete operations which have already been established. He advocates the use of the x-ray and radium in addition to operative procedures. He points out that the x-ray is more applicable for cases requiring diffuse radiation, whereas radium is better where small areas are to be reached. He thinks that preliminary radiation with x-ray is beneficial and that it may convert an inoperable tumor to an apparently operable one. He advises the prophylactic use of radium at the time of operation, apply-

ing 25 or 50 mg. tubes to localized areas especially the intercostal and supraclavicular glands. He also urges the importance of open air treatment as a prophylaxis against recurrence and as being helpful in forms of inoperable cancer.

F. L. ADAIR.

Items

To the Editor:

Two statements in the recent most interesting paper of M. R. Robinson and B. Zondek, "Experimental Attempts to Promote Uterine Growth," which appeared in the July issue of your Journal, require correction.

The authors state that Wintz (Arch. f. Gynäkologie, 1920, cxiii, 457) "conceived the idea of utilizing the liquor follicle in its unaltered state, for therapeutic purposes. The results were far beyond his expectations, etc." *His expectations must have been most modest* for to use Wintz's words, "Aus diesen kurz angeführten Resultaten lässt sich also erschen, dass irgendwelche typische Reaktion, ausgelöst durch den Follikelsaft, nicht beobachtet werden kann," which translated verbatim reads: "From these briefly reported results, one can see, that no typical reaction whatever, ascribable to follicle juice, can be noted."

Wintz also obtained negative results in studying the effect upon the genital tract of rabbits when using follicle juice. I, perhaps because I employed larger dosage, was able to develop marked genital growth phenomena in rabbits by injecting follicle fluid. This observation should certainly not be classed as "continuing the experiments of Wintz," as Robinson and Zondek put it.

My main reason, however, for penning this communication is to make perfectly clear that the meaning read into the quotation from one of my papers (Frank, R. T., and Rosenbloom, J., Surg. Gyn. and Obst., 1915, xxi, 646) by Robinson and Zondek is their own, and is not shared in any way by me, as the unwary reader might mistakenly be led to conclude.

The quotation referred to the fat soluble extracts of the placenta and reads "that the extract containing all of the fat soluble substances is by far the most potent." Robinson and Zondek from this appear to draw the conclusion that "This fact has a vital bearing upon the pharmacology of organic extracts, and furnishes the axiom, that, just as endocrinopathies are due to pluriglandular disturbances, so is the active principle of the ductless gland not contained in any singular (single?) portion of the gland, but in the gland as a whole." The italics are theirs.

My own deduction from the fact that the entire alcohol soluble

portion (for this was found to be the universal solvent) was more potent than any fraction obtainable, was far less far reaching than that of Robinson and Zondek. I concluded that loss of active substance occurred during the fractionating, which conclusion has been borne out by all my later work. I might add that it appears distinctly hazardous to base far-reaching generalizations upon such a slender foundation.

Very truly yours,
ROBERT L. FRANK.

July 24, 1924, Denver, Colo.

Increase in Size and Subscription Price

The amount of excellent material that is being offered to the Journal and that should be published has made it necessary that we increase its size and therefore unavoidably also the subscription price.

This change will take effect with the October issue. From that date on between sixteen and thirty-two pages will be added in each number, while the subscription price will be increased only one dollar per annum.

No effort or expense has been spared or will be spared to make this the outstanding journal of the world on obstetrics and gynecology published in the English language.

The American Journal of Obstetrics and Gynecology

VOL. VIII

ST. LOUIS, OCTOBER, 1924

No. 4

Original Communications

HYPERPLASIA OF THE ENDOMETRIUM—A CLINICAL AND PATHOLOGICAL STUDY*

BY EMIL NOVAK, M.D., BALTIMORE, MD., AND KARL H. MARTZLOFF, M.D.,
PORTLAND, ORE.

From the Gynecological Department of Johns Hopkins Medical School.

IN TWO previous publications one of us (Novak)^{1, 2} has emphasized the frequency and the great importance of hyperplasia of the endometrium, especially in its relation to so-called functional uterine hemorrhage. The term hyperplasia is often used loosely as applying to various hypertrophic and hyperplastic conditions of the endometrium. Its employment, however, should be restricted to the distinct clinical and histological entity described by Cullen in 1900, and on various occasions since then. This lesion is without doubt one of the most interesting and most important of all endometrial conditions, and it is therefore surprising that the gynecologists of America at least have been so slow to appreciate its significance. Even now there are only a few clinics and laboratories where this disease of the endometrium is properly evaluated, while in many it appears to be overlooked altogether. The German school has been far more active in the investigation of this affection, and their literature of recent years contains many papers dealing with various aspects of the problem.

We have, in our own work, been more and more impressed with the importance of this entity, the thorough elucidation of which is sure to throw much light upon the whole problem of the fundamental

*Read at the Forty-ninth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 15-17, 1924. This paper, here abbreviated, will appear in full in the authors' reprints and in the Transactions of the Society for 1924. This accounts for seeming discrepancies in table numbers.

mechanism of menstruation. In view of Dr. Cullen's pioneer work³ in the study of hyperplasia, (*vide infra*) it would seem especially fitting that a complete review of this question should be undertaken in the clinic of which he is the head. In the previous publications from this department, to which reference has been made above, the subject was treated along very general lines. Accurate data, however, can come only from the analytical study of a large number of cases. We have, therefore, gone over the material in the Laboratory of Gynecological Pathology of Johns Hopkins Hospital for the past five years. During this period a large number of specimens of hyperplasia have been studied. Many of these, however, are from material which had been sent into the laboratory from outside sources, and in these complete histories were usually lacking. It seemed wise, therefore, to limit the analysis to those cases treated in the Johns Hopkins Hospital itself, for in all of these, complete data were available. The many outside cases, however, have been of great value in this study, in that many of them have illustrated various aspects of the general problem, and have thus furnished a more expansive background for the study. The total number of cases studied is certainly at least double the number actually included in the analysis.

In all, 66 cases of hyperplasia, operated on in the gynecological department of Johns Hopkins Hospital, are available for study. In 32 of these cases hysterectomy had been performed, so that the entire uterus was available for study. In the remaining cases, 34 in number, only curettage was performed, so that only the scrapings are available. Of the 32 hysterectomy cases, it should be emphasized that, with nine exceptions, the operation was performed for associated lesions such as myoma or inflammatory disease. This point should be borne in mind throughout our paper, *viz.*, that the study takes as its point of departure the histologically demonstrated specimens of hyperplasia, whether these were the cause of the clinical symptoms or whether they were merely incidental. In other words, the analysis is not based only upon cases of hyperplasia operated upon for the excessive bleeding which we have come to look upon as characteristic of the condition. This is an important distinction to make. Our plan, we felt, would give us a broader viewpoint. For example, the study would include cases of hyperplasia which possibly are not associated with bleeding. Furthermore, we decided not to exclude cases with associated lesions, as our previous investigations had led us to conclude that the endometrial condition was probably secondary to some ovarian secretory disorder, and that this might be either functional or, on the other hand, that it might be associated with some definite pelvic lesion. We were anxious, therefore, to include both types in our study, and we may anticipate by saying that the clinical and

pathological characteristics of hyperplasia were the same, regardless of whether or not it was associated with demonstrable pelvic disease.

Of the 32 uteri removed, there were nine, as already stated, which showed no other change than the hyperplasia. The other 23 contained myomata or adenomyomata which, as a rule, were small and of merely laboratory importance. In 11 of the cases the growths were intramural, in four submucous, and in one subserous. Adenomyoma alone was present in three cases, and in the remaining five adenomyoma was combined with myoma.

The tubes were described as normal (either in the laboratory, or when not removed, in the operating room) in 15 cases. Chronic salpingitis was present in 13 cases, and subacute salpingitis in three.

GENERAL CHARACTERISTICS OF HYPERPLASIA

The study of hyperplasia of the endometrium is inseparably bound up with that of the so-called functional type of uterine hemorrhage. Unlike amenorrhea, excessive menstruation is usually of local rather than constitutional origin. There is an important group of cases, however, in which hemorrhage occurs in the entire absence of any gross pelvic disease. Perhaps most characteristically is this noted at the two extremes of menstrual life, puberty and the climacterium. The endometrium in such cases almost invariably presents the typical picture of hyperplasia. Indeed, exceptions to this rule are so rare that, if hyperplasia be not found in such a case, one is inclined to suspect the existence, even though it may not be demonstrable, of some latent anatomic lesion, such as a submucous myoma.

The histological characteristics of hyperplasia are extremely distinctive. The endometrium is often, though not invariably, much thickened. In some cases it is enormously overgrown and polypoid (Fig. 1), so that curettage might readily lead to the suspicion of malignancy. In other cases, again, the endometrium may be smooth and of normal thickness. The microscopic picture is, in the outspoken case, very distinctive, so that the diagnosis may be made at a glance. Both epithelial and stromal elements are hyperplastic. The hyperplasia of the epithelium is perhaps chiefly responsible for the characteristic gland pattern which, more than any other one feature, strikes the diagnostic eye. The glands lack the uniformity so characteristic of the endometrium in any one of its menstrual phases. We are accustomed to speak of the endometrium as presenting a "swiss cheese" pattern in these cases. Large dilated glands are found side by side with glands which are small, narrow and nontortuous. The dilated glands suggest somewhat the appearance of retention cysts, except that in most of them the epithelium, instead of being flattened out and atrophic, is well preserved. It may even show some slight

thickening. This same thickening is often noted in the undilated glands and on the surface. The nuclei are commonly quite heavy and more solid-looking than in the normal endometrium. Not infrequently there may be in places a double row of epithelial cells. The stroma is characterized by its abundance. In the typical case it is dense and compact. Mitoses are frequently seen in the stromal cells, far more frequently than in the nonhyperplastic endometrium. In some cases, as we shall discuss later, the epithelial and glandular changes predominate, in others the stromal participation is most striking.

CLINICAL CHARACTERISTICS

Age of Occurrence.—In a general way it may be stated that hyperplasia may occur at any period of reproductive life. We have noted it at as early an age as twelve and at as late an age as fifty-four. In the series of 66 cases now under analysis the extremes are nineteen and fifty-four years. It must, however, be emphasized that these figures apply to the ages of the patients when they entered the hospital for treatment and not to the age at the time of onset of abnormal symptoms. The latter figures are of course easily arrived at from a study of the clinical histories. To show the discrepancies between the two sets of figures, we might cite one case in which the patient was forty-three years of age at the time of admission to the hospital. The history of abnormal bleeding, however, extended back for at least fifteen years before admission, so that, presumably at any rate, the hyperplasia had its inception at the age of about twenty-eight. In the same way the patient already alluded to as the youngest in the series was nineteen when she came under observation, but her ailment had followed an influenzal infection three years previously, and about four years after the establishment of the menstrual function.

Table I illustrates graphically the distribution of patients at different age periods, as they presented themselves on admission.

Practically the same information is embodied in Table II, except that it is here compared with the age incidence as regards the actual onset of symptoms. The two sets of figures, it will be noted, are in a general way parallel.

Relative Frequency of Menorrhagia and Metrorrhagia.—On this point our study has given results somewhat different from what we had expected. Here again one must emphasize the difficulty of securing accurate data, for it is often hard to draw a line between menorrhagia and metrorrhagia. The latter is often more apparent than real, the individual periods being so much prolonged that one merges into another, giving rise to a continuous bleeding. In other cases, where there is only a slight intermenstrual bleeding, well removed from the periods, the distinction is easier to make. Menorrhagia was

TABLE I

	AGES IN YEARS (INCLUSIVE)							
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
Number of patients	4.5%	9.1%	7.5%	16.6%	15.1%	16.6%	19.7%	10.6%

TABLE II

	AGES IN YEARS (INCLUSIVE)							
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
Number of patients and age on admission	4.5%	9.4%	7.5%	16.6%	15.1%	16.6%	19.7%	10.6%
Number of patients and age when present illness began	3	8	6	10	12	14	9	4
	4.5%	12.1%	9.4%	15.1%	18.1%	21.2%	13.6%	6.-%

noted in 35 of the cases. In 5 of these, however, there was also a greater or less amount of intermenstrual bleeding. The manner in which menorrhagia may gradually merge into metrorrhagia is illustrated by a patient who gave a history of menorrhagia with prolongation of the intermenstrual intervals, for at least eighteen months. There then occurred a period of constant bleeding lasting two months, and continuing up to the time of admission to the hospital. The interval in 26 of the menorrhagia cases was practically normal, in one it was prolonged, in 8 it was totally irregular.

Metrorrhagia, there being practically no interruption to the bleeding, occurred in 24 patients. Reference to Table IV gives one an idea of the long duration of the bleeding in some of these cases.

There were 2 cases in which metrorrhagia occurred in women beyond the menopause. In one instance the patient, who is said to have had the menopause five years previously, began to bleed, and this symptom persisted for six weeks, until she came into the hospital. The other case was that of a woman in the second year after the menopause. There had been continuous bleeding for four weeks preceding her entrance to the hospital. Operation revealed a normal uterus, except for the hyperplasia. We can offer only a theoretical

TABLE IV

SHOWING THE DURATION OF THE MENSTRUAL PERIOD OR BLEEDING ATTACK IN 55 PATIENTS FOLLOWING THE ONSET OF THE SYMPTOMS OF HYPERPLASIA

Duration of Menses or of Bleeding Attack								
	7 days	8 days	10 days	2 wks.	3 wks.	4 wks.	5 wks.	
Number of Patients	1	6	1	12	5	2	4	
Percentage	1.8%	10.9%	1.8%	21.8%	9.1%	3.6%	7.2%	
Duration of Menses or of Bleeding Attack								
	6 wks.	2 mos.	3 mos.	4 mos.	6 mos.	1 yr.	2 yr.	
Number of Patients	5	9	1	2	1	4	2	
Percentage	9.1%	16.3%	1.8%	3.6%	1.8%	7.2%	3.6%	

explanation of the bleeding in cases of this type. They are apparently analogous to those in which pregnancy occurs after the cessation of the menstrual function. The explanation commonly given for the latter group is that ovulation has continued even though menstruation has ceased, the amenorrhea being due to an inhibition of the menstrual phenomenon by some unknown factor. We are frank to say, however, that this explanation seems far less plausible in the patient who has passed the menopause several years previously than in the one where only a few months have elapsed. Cases of this type, however, are very infrequent.

PATHOLOGY

Gross Characteristics of Uterus.—The length of the uterine cavity was measured in 38 instances. In the case of uteri removed at operation this measurement was of course made in the laboratory; in the

TABLE VI

SHOWING FOR THE 38 CASES THE LENGTH OF THE UTERINE CAVITY AND NUMBER OF CASES COMING UNDER EACH MEASUREMENT

LENGTH IN CENTIMETERS									
	5 cm.	5 cm.	6 cm.	6.5 cm.	7 cm.	7.5 cm.	8 cm.	8.5 cm.	9 cm.
Number of cases	2	1	8	0	7	5	9	2	4

eases which were eurented, the uterine depth was measured at operation by means of a uterine sound. The results in these 38 cases are shown in Table VI. It will be seen that in practically none of these has there been any increase in the size of the uterine cavity, even though many of them, as we have stated, showed small myomata or adenomyomata. The myometrium in general has shown no demonstrable change, except as would be expected in association with myomatous or adenomyomatous tumors, when these have been present. The average thickness of the myometrium has been about 2.5 cm.

The Endometrium.—(a) *Topography.* Of 29 cases of hyperplasia in which the uterus was available for gross study the endometrium was smooth in 19 and of polypoid character in 10. Of the 19 cases with smooth endometrium, the latter was thin (1 to 2 mm.) in 4 specimens, of moderate thickness (3 to 4 mm.) in 6, and thick (5 to 8 mm.) in 6 others. In 3 of this group the thickness of the endometrium was not determined.

Of the 10 specimens with macroscopically polypoid endometrium, the latter was described as thick (5 to 10 mm.) in 6, thin in 2, and in 2 the thickness was not determined.

(b) *Amount of tissue obtained by curettage.* In 25 of the eurented cases notes were made as to the quantity of material removed. The deductions to be made from these notes are of course not to be con-

sidered in a mathematical way. The descriptive terms used are open to the criticism that the subjective factor is not eliminated. Nevertheless, we believe that they indicate quite fairly the usual findings in hyperplasia cases. In 7 cases the amount of tissue was described as "very abundant," in 4 as "somewhat more than normal," in 5 as "moderate," and in 9 as "scanty."

It might be added that, generally speaking, the age of the patients showed no relation to either the topography of the endometrium or the amount of tissue obtained on curetting. Patients at the age of the menopause, and especially the few beyond 50, practically always showed a thin and scanty endometrium.

These results were not altogether expected by us, especially in that they demonstrated the frequency with which hyperplasia is found in endometriums which show little or no thickening. In his early work on the subject Cullen called attention to the fact that at times, even in very young girls, the amount of tissue obtained may be so enormous that it at once suggests carcinoma. When this great overgrowth of endometrium occurs at the menopausal age, the suggestion of malignancy is of course even greater (Fig. 1). Many a uterus has thus been removed under an erroneous diagnosis of cancer. This is one of the most practical aspects of the whole problem of hyperplasia, as we shall emphasize later.

Cullen speaks of a case in which the curettings filled a whole curetting bottle (1 ounce) and we have likewise observed a number of these very striking cases. On the other hand, our study shows that in the largest number of cases the endometrium is not strikingly increased in amount, even though the histological picture is perfectly distinctive of hyperplasia.

It is difficult to explain these individual variations in the gross thickness of the endometrium in cases which clinically present the same characteristics. The assumption would be that the duration of the process is the most important influencing factor in this regard, and that the cases of extreme endometrial overgrowth are those of longest duration. This idea, however, is not always borne out by the history. We have seen an enormous quantity of tissue obtained on curetting in a child of twelve who had bled for only three months. On the other hand many of the patients with thin endometriums had had bleeding for very much longer periods. We can suggest no explanation for these differences.

In the cases with thin uterine mucous membrane, the term hyperplasia in its usually accepted sense would seem to be something of a misnomer. And yet the histological features of such cases are exactly like those in cases associated with very abundant endometrium. Furthermore, the clinical characteristics are also identical.

(c) *Gland changes.* Without question the most distinctive histological feature of hyperplasia is the characteristic gland pattern. (Figs. 2 and 3.) Small glands of the postmenstrual or early interval type are found side by side with large dilated glands resembling small cysts. In some of these the epithelium is well preserved and may even show slight thickening. In others it is much lower and perhaps even flat. So constant are these gland changes that one would hesitate to diagnose hyperplasia in their absence. In the full-blown case they are so striking that a glance through the microscope gives



Fig. 1.—Gross appearance of interior of uterus with marked hyperplasia. Such a polypoid overgrowth is not by any means constant, and in many cases the mucosa shows little or no gross change. A condition like that illustrated has commonly been designated polypoid endometritis, but this term is a misnomer, as there is no evidence of inflammation. Note the sharp limitations of the condition to the endometrium proper, and the noninvolvement of the cervix. It is easy to see how curettage in such a case may lead to the suspicion of malignancy.

one the diagnosis instantly. Every one of our 66 cases showed these gland changes, but in varying degree.

To appreciate the significance of these gland changes one must bear in mind the fact that the endometrium consists of several rather definite layers. The superficial compact layer exhibits chiefly the necks of the glands, with abundant stroma in between. In the deeper spongy portion, the gland lumina are more thickly placed, and there



FIG. 2.—Typical hyperplasia in a girl of 19, who had had menorrhagia for two years.



FIG. 3.—Hyperplasia in a woman of 43, with history of bleeding for eight months. The same "Swiss cheese" pattern is seen as in Fig. 2.

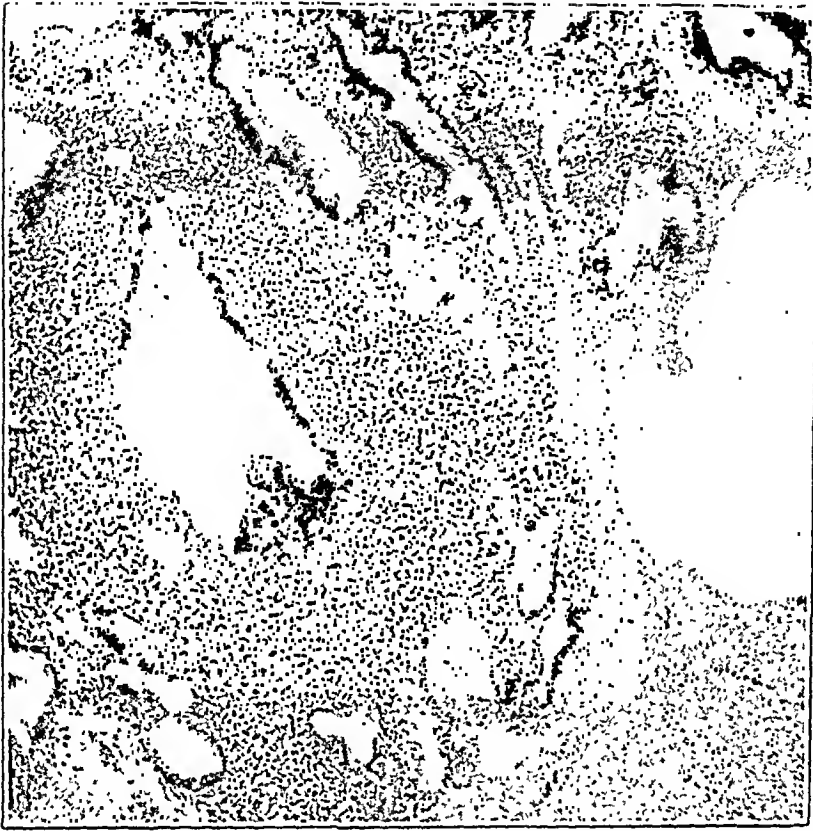


Fig. 4.—Moderate hyperplasia. Some of glands showing definite premenstrual hypertrophy with secretory activity. This patient later returned for hysterectomy at which time definite hyperplasia was found (see Fig. 5).



Fig. 5.—Hyperplasia on surface endometrium of adenomyomatous uterus. Curettage of this patient some months earlier had yielded endometrium shown in Fig. 4.

is less stroma. In the premenstrual epoch there is of course marked hypertrophy and tortuosity of these glands, so that the spongy character of this layer is more apparent. Finally, there is a third zone at the very bottom of the endometrium. This, designated as the basal layer, is of dense compact structure, with glands always of the quiescent type, even in the premenstruum. In other words, this layer seems not to take part in the menstrual cycle. Its histological distinctness is shown in Fig. 7, where the basalis is sharply marked off from the other strata.

From our present standpoint it is of interest to note that large dilated glands, not unlike those seen in hyperplasia, appear to be a not infrequent normal finding in the basal layer. They may even push up into the spongy layer. When they are at all large or numerous, however, the diagnosis of hyperplasia may be made, especially when they involve all the layers, as they do in marked cases. We have been much interested in trying to learn the nature of this change. If the gland overgrowth is due, as has been suggested by some, to a marked proliferation of the epithelial elements, why should some of the glands so far outstrip their neighbors? Many of the glands, it will be recalled, are very narrow and collapsed, while others may show enormously enlarged lumina. Furthermore, many of the large glands show very little evidence of such active epithelial overgrowth as must be assumed to explain their large size.

Another explanation which suggests itself is that the enlargement is in the nature of retention cyst formation, analogous to the formation of retention cysts in the cervical glands. Against this the argument is offered that frequently, even in the case of very much enlarged glands, the epithelium is quite intact and that it shows no evidence of the flattening and pressure atrophy so characteristic of retention cysts. Furthermore, in a process in which inflammation appears to play little or no part, it is not easy to conceive of a blockage of the gland lumina, with cyst formation.

The fact that glands similar to the large glands of hyperplasia are at times seen in the basal stratum of the normal endometrium suggests that possibly the hyperplasia picture, with its large glands, perhaps immediately under the surface and throughout the endometrial thickness, may be the result of a loss of differentiation of the endometrial layers. The normal endometrium is made up of the three layers already described, all well differentiated from one another. Especially sharp is the differentiation between the basal layer and the other two. This basal layer takes no part in the menstrual cycle. Its stroma is dense and compact and its glands are commonly of the interval or quiescent type. Not infrequently they are dilated (Fig. 7). In short, the histology of this basal layer is almost identical with that



Fig. 6.—Marked epithelial thickening in some of the deeper glands in a case of hyperplasia. This, in some cases, is very marked, in others absent altogether.

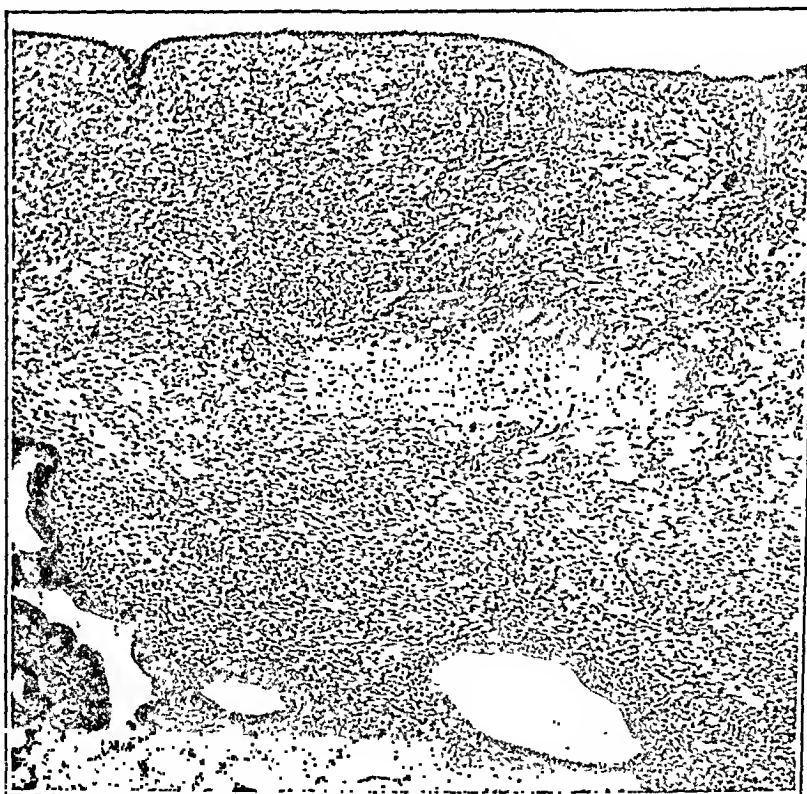


Fig. 7.—Note the histologic distinctness of the basal layer, more sharply marked in this case because of the edema of the upper layers. Observe also the hyperplasia-like pattern of the basalis.

of a hyperplastic endometrium. The hypothesis which suggests itself, therefore, is that in cases of hyperplasia the endometrium is made up practically altogether of an enormously overgrown basalis and that the two functional layers of the endometrium are absent. This, as we shall see, checks up well with most of the known facts concerning the etiology of hyperplasia.

Dilated glands were found in every one of our 66 cases of hyperplasia, though in varying degree. In 17 specimens this glandular dilatation was extreme and involved the entire thickness of the endometrium. In 31 it was of moderate degree. In 29 of this moderate degree group the gland change was distributed throughout the entire endometrium and in the other two it was confined to the more superficial zones. Finally, in a third group of 17 cases, diagnosed hyperplasia, there were only occasional dilated glands to be seen, usually distributed uniformly throughout the endometrium, but in a few cases confined to one or other of the layers. In one case they were limited to the deeper layer alone, but the patient, a woman of 26, suffered with profuse menorrhagia. This case illustrates the fact that the degree of gland change noted is not by any means to be taken as a criterion of the clinical history of the case.

(d) *Stromal Changes*.—In general, the stroma in cases of hyperplasia is excessive in amount. In some this increase is very pronounced, so that broad expanses of stroma are observed with only occasional gland lumina. More frequently, the increase is of moderate degree, though definite enough. Most often the stroma, in addition to its overabundance, is dense and compact. It must be remembered, however, that, in curettings at least, the occurrence of edema or hemorrhages in the endometrium may give the stroma a somewhat lighter texture.

Mitoses are usually to be found in the stroma (Fig. 8). This was true in fully 50 of our 66 specimens (75.7 per cent). The finding of mitoses depends in part, of course, upon the technic employed, and especially upon the length of time between the removal of the specimen and its fixation. With regard to their significance not much of a definite nature can be stated. In general they are of course indicative of proliferative activity in the stroma, where mitoses are so infrequent under normal conditions. They do, however, occur in endometria which are certainly not hyperplastic in the pathologic sense, and on the other hand, they are rarely abundant even in cases of definite hyperplasia. Furthermore, they are not necessarily most frequent in the specimens in which the stroma is most abundant. For example, there were 7 specimens in which the stromal increase was rather debatable. Four of these showed stromal mitoses and 3 did not.

We have been much interested in a group of cases in which there was an extreme overabundance of stroma, with usually mitoses, but

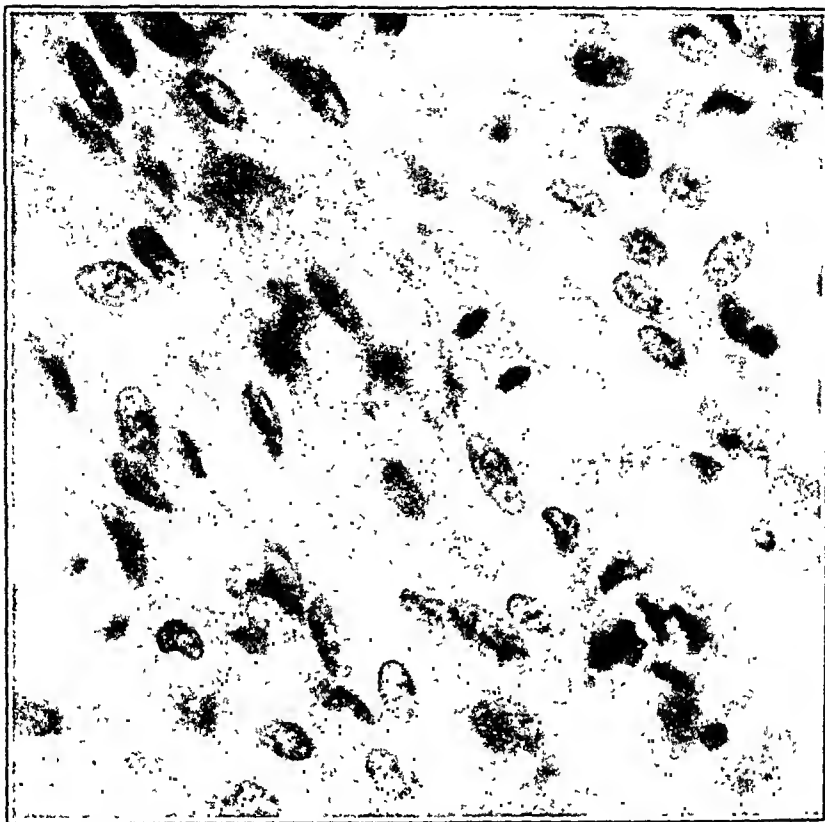


Fig. 8.—Mitotic figures in stroma of hyperplastic endometrium. Two are seen in this field, one in focus near center, the second, not in focus, near lower left corner.

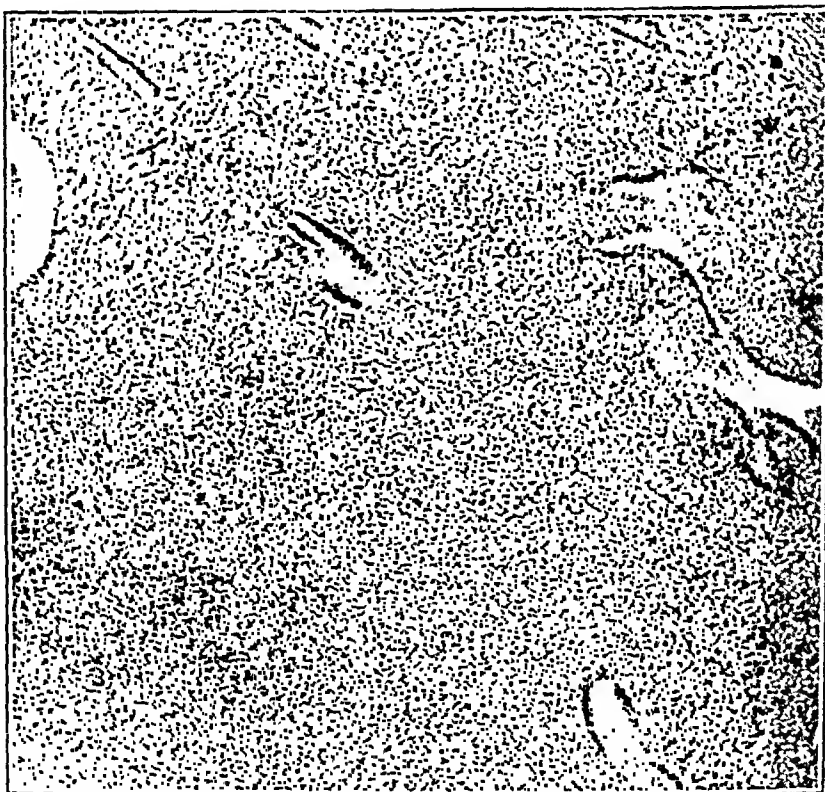


Fig. 9.—Stromal type of hyperplasia, with great overgrowth of stroma and little epithelial or glandular change.

without glandular changes of hyperplasia (Fig. 9). In this group, which we have not felt justified in including in the present series, it nevertheless seemed to us that pretty much the same process was concerned. In other words, it seems that the hyperplasia, which usually affects both epithelial and stromal elements, may involve one of these elements far more than the other. In the few cases of this stromal type of hyperplasia, as we might perhaps call it, which we have studied, the history has often been suggestive of hyperplasia. In one case, for instance (Gyn. Path., No. 26235) there was an enormous overgrowth of stroma, with rather numerous mitoses. Only one slightly dilated gland was seen in the entire section. This patient, who was 34 years of age, had had menorrhagia for ten years. In another case, (Gyn. Path., No. 25059) somewhat less marked histologically, there had been menorrhagia for three months.

The assumption that a stromal type of hyperplasia exists is not unreasonable when one bears in mind the possibilities with adenomyoma, as exemplified in the case reported from this clinic by Casler²⁷ some years ago. The growth in this case was made up entirely of endometrial stroma cells, with a complete absence of gland elements.

Hyperplasia in Uterine Polypi.—As was mentioned early in this paper, the endometrium in cases of hyperplasia is often distinctly polypoid. In this section, however, we have reference to the relation existing between hyperplasia and well defined, usually single, polypi of the uterus. In a group of 104 cases selected for study, including our 66 cases of hyperplasia, there were 14 instances of polypi, 9 corporeal and 5 cervical. The interesting point in connection with the 9 endometrial polypi is that they all presented a histological picture of typical hyperplasia. This is all the more interesting in that only two of these polypi were associated with diffuse hyperplasia of the endometrium proper. Both of these were characterized clinically by abnormal bleeding, as might have been expected. There were only two other bleeding cases among these 9 with polypi. In one the endometrium showed no hyperplasia, but a well-marked premenstrual hypertrophy, with a maturing corpus luteum in one ovary. In this case there were several myomata in the uterus, which may have had something to do with the bleeding. In the fourth case associated with bleeding, the polyp was partially strangulated, and its surface showed ulceration, probably explaining the hemorrhage.

The 5 patients with endometrial polypi of hyperplastic character not associated with a history of abnormal bleeding entered the hospital for other lesions, either myomata or pelvic inflammatory disease. In three cases there were myomata, although none were submucous. In 2 of these 3 cases the endometrium showed a premenstrual hypertrophy.



Fig. 10.—Unusually marked thrombosis in a case of hyperplasia. The significance of these thromboses is not clear.



Fig. 11.—Uterine polyp showing typical hyperplasia pattern. Such polypi do not respond to menstrual histologic reaction (see text).

In two there was a chronic salpingitis. The ovary of two of these showed a normal corpus luteum.

The deduction to be drawn from the above recital is that hyperplasia may be localized in uterine polypi (Fig. 11), but that this circumscribed form of hyperplasia is not characteristically associated with bleeding, as is the diffuse process. It has another rather important bearing as regards the general nature of uterine polypi. Many of these have a structure identical with that of hyperplasia of the endometrium; others, by no means infrequent, have a structure exactly like that of the superficial functioning layers of the endometrium. The former evidently spring from the basalis and, as one might expect, do not participate in the menstrual reaction. The second group apparently arise from the more superficial layers and exhibit the same menstrual phases as does the endometrium proper. Premenstrual hypertrophy is frequently observed in such polypi.

The 5 cervical polypi noted are much less instructive, as they probably have no direct relationship with hyperplasia. It is true that hyperplasia of the endometrium was associated with 4 of these, but this almost certainly was due to the fact that it was a hyperplasia series, in large measure, which was under study. The structure of these cervical polypi did not differ from that typical of this lesion under other circumstances.

This discussion of polypi suggests an allusion to the so-called polypoid endometritis concerning which so much has been written in the past, and which is even yet described as an entity by certain modern textbook authors. This condition is not an endometritis at all, but, as may be gathered from what has been already written, is produced by the enormous endometrial overgrowth at times occurring with hyperplasia. The term "polypoid endometritis," as applied to such cases, is of course a misnomer. "Polypoid hyperplasia" would be better.

Condition of the Ovaries.—We hesitate to discuss this, one of the most important aspects of the whole subject, for the simple reason that on this point our material is of necessity very incomplete. The explanation for this fact lies in the extreme conservatism of this clinic in the removal of ovaries. Unless both ovaries, in their entirety, are available for study, it is unsafe to draw conclusions concerning such matters as to the presence or absence of corpora lutea, this being one of the most important subjects for consideration in association with hyperplasia, as will be discussed below. In the 32 cases in which hysterectomy was done some ovarian tissue, usually one ovary, was removed in 22. The findings may be given for what little they are worth, viz.

Normal ovary, without corpus luteum.....	1 case.
Normal ovary, with corpus luteum.....	4 cases.
Normal ovary, with follicular cysts.....	8 cases.
Tubo-ovarian abscess.....	2 cases.
Senile ovaries.....	7 cases.

Schröder's material gave him far better opportunity of studying the ovarian changes accompanying hyperplasia, as in fully 31 of his 54 cases both ovaries had been removed *in toto*. Macroscopically he invariably found small follicular cysts, varying in size from that of a pea to that of a walnut. In no case did he find macroscopic evidence



Fig. 12.—Typical hyperplasia in one of the endometrial islands which is found deep in the musculature in a case of adenomyoma.

of a corpus luteum formation. In 2 of his specimens he found the remains of a small ovarian hematoma. Microscopically, the absence of active corpora lutea was confirmed. In only one case was there an old retrogressed corpus and in one a corpus in the stage of proliferation. The latter findings Schröder suggests may be due to rupture of the antecedent follicle by bimanual examination on the day before operation.

Our own findings, incomplete as they admittedly are in this respect, throw some doubt upon the point especially emphasized by Schröder, i.e., the absence of corpora lutea. In at least 4 cases where definite

hyperplasia was observed, we have found definite corpora lutea in the ovary. As already stated, our study of the ovaries in association with hyperplasia has been greatly handicapped by the fact that only rarely have both ovaries been removed, and that negative findings mean very little unless both ovaries are available for study. Our loss in this respect, we trust, has been the patients' gain. On the other hand, the finding of corpora lutea in even a few cases is all the more significant in such a series as ours. It is quite possible that more corpora would have been found had a complete study of the ovaries been possible. Fig. 13 shows the endometrium in a case of definite hyperplasia with menorrhagia for 6 months. The duration of the

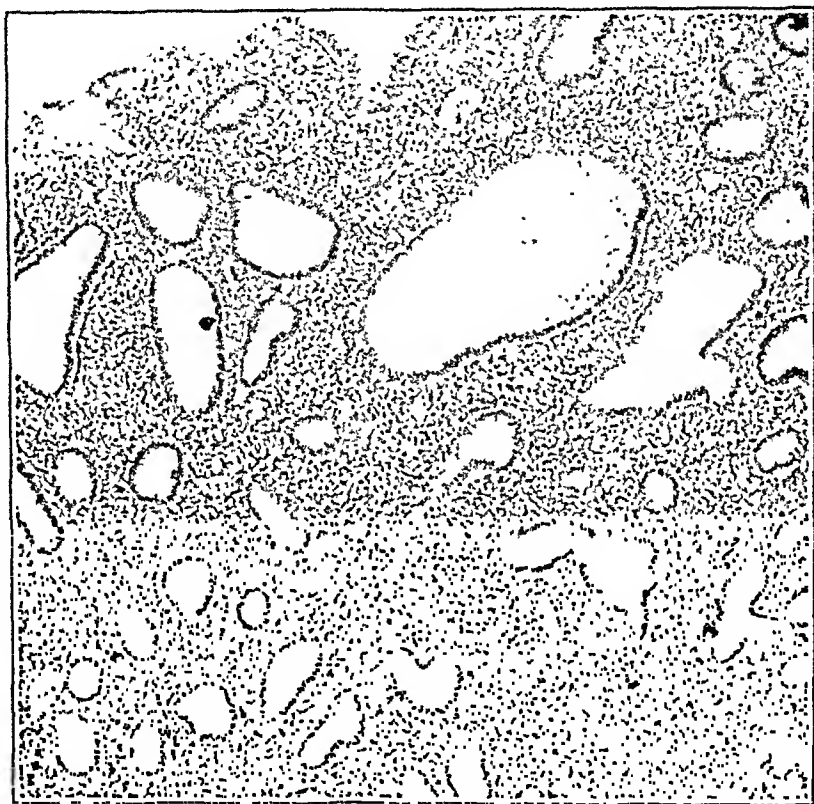


Fig. 13.—Hyperplasia in a case associated with menorrhagia of six months' duration. A maturing corpus luteum was found in the ovary of this case (see Fig. 11).

menstrual periods was 7 days, as against 4 days before the onset of the affection. Fig. 14 shows the corpus luteum present in this case. It is in a state of beginning retrogression.

We believe, therefore, that Schröder's findings should be subjected to further scrutiny. It is true that his theory explains the clinical and pathological characteristics of hyperplasia quite satisfactorily, with perhaps one exception. If corpora lutea are always absent in cases of hyperplasia, as he asserts, how can one explain the fact that in so many cases the bleeding is of the periodic or cyclical type, i.e., menorrhagia, rather than metrorrhagia. The cyclical structure in the

ovary is, par excellence, the corpus luteum. In the metrorrhagia cases, the absence of corpora lutea would not be surprising, but it is hard to check up with the cases of excessive bleeding occurring only at the time of the periods. Whether corpora are absent in the one group and present in the other we are certainly not in a position to state from our own restricted observations on this point, but this would seem to be a logical working hypothesis.

The multiple cysts found in the ovaries by Schröder he describes as intact unruptured follicles, lined often by three or four layers of granulosa, and surrounded by a delicate fibrous layer. There was no evidence whatsoever of degeneration. Indeed, mitoses were noted here and there in the sections, and occasionally an intact ovum. Hyper-

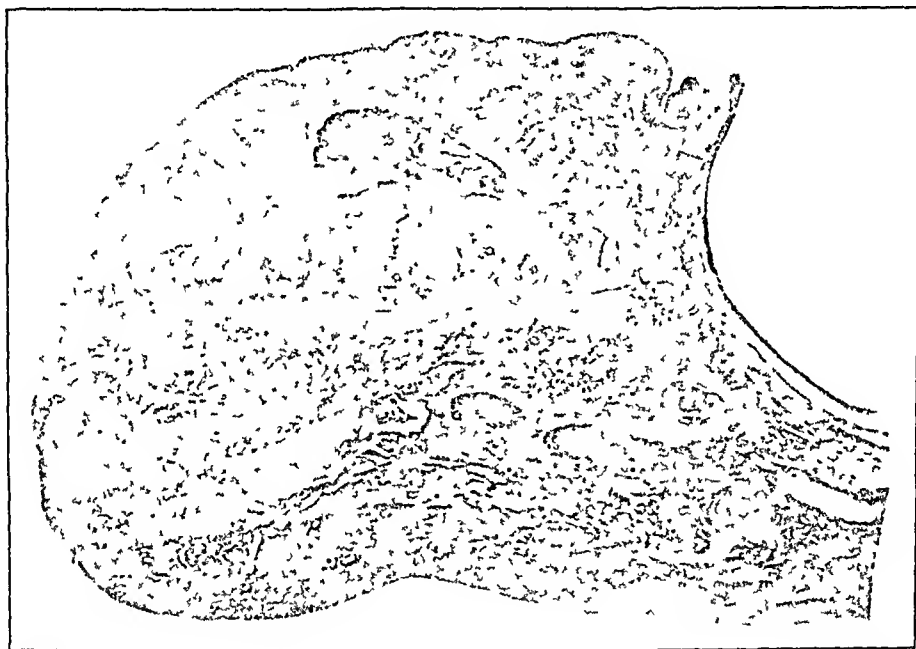


Fig 14.—Large maturing corpus luteum found with hyperplastic endometrium shown in Fig. 13.

trophy of the theca was a constant finding, though a hypertrophic granulosa was found in only a fraction of the cases. Meyer's findings were in a general way similar to those of Schröder, but his interpretation is somewhat different. Schröder believes that the persistent unruptured follicles produce a prolonged proliferative stage in the endometrium, and that the secretory phase is held in abeyance by the failure of follicular rupture to occur, with the consequent absence of corpora lutea. Meyer, on the other hand, suggests that the findings of numerous atretic follicles indicates that the ova do not attain full development, their death entailing a failure of follicular rupture and of corpus luteum formation.

It must be admitted that Schröder's hypothesis, ascribing a causative importance to the absence of corpora lutea, fits in rather well

with our present day conception of menstrual physiology. The only portion of the endometrium which is not responsive to the cyclical stimulus of the corpus luteum is the basalis, as was discussed earlier in this paper. This apparently takes no essential part in the histological changes noted with the changing phases of the menstrual cycle. Menstrual changes are universally conceded to be due to the endocrine influence of the corpus luteum. When the latter is absent, it would seem that the more slowly growing basalis would soon dominate the endometrial picture, in other words, that the endometrium would soon consist of practically nothing but an enormously overgrown basalis. This conception is borne out by the fact, already emphasized, that the histological picture presented by the endometrium in cases of hyperplasia is identical with that so often normally seen in the basalis.

As to the cause of the bleeding itself, it seems unwise to speculate, in the present state of our knowledge. It is certain, we believe, that the bleeding does not occur merely because the endometrium is thicker than normal and hyperplastic. This is well illustrated by the instructive case reported by Büttner, and quoted earlier in this paper. The evidence is overwhelming, we believe, that the real underlying cause is an endocrine disorder affecting the ovary, either primarily or secondarily. Many authors have written concerning the so-called biological function of the endometrium (Sturmdorf, Goffe, Schiekele). No definite biological change characteristic of these bleeding cases has as yet been satisfactorily demonstrated and, even if it were, it would seem that such a physiological alteration would be merely a local manifestation of the underlying ovarian cause, in the same sense that the anatomic changes in hyperplasia are secondary to the ovarian endocrinopathy.

That hyperplasia of the endometrium is caused by a functional ovarian disorder is attested by many facts. For example, it is observed, in general, only during the reproductive epoch, when the ovaries are functioning. It may occur in very young girls, under conditions practically eliminating the possibility of an inflammatory factor. It is checked by removing the ovaries, or by destroying the ovarian function by x-ray or radium. Curettage in hyperplasia cases usually gives only temporary relief from the bleeding. The recurrence of the latter is ostensibly due to a persistence of the underlying ovarian disorder. A repetition of the curettage again yields a hyperplastic endometrium, suggesting the secondary nature of the latter. This fact is well shown in a recent case of one of us (Novak), not included in this series. A woman of 26 was curetted in December of 1922 for uterine bleeding. Microscopic examination of the curettings showed definite hyperplasia (Fig. 15). Bleeding recurred

about one month after the operation and persisted for one month, when a second curettage was performed. The curettings again showed a very definite hyperplasia (Fig. 16). In other words, within two months the hyperplasia of the endometrium had recurred. The pictures presented by the two sections (depicted in Figs. 15 and 16) are almost identical. Dr. William T. Watson, of Baltimore, had a patient who was bedridden on account of uterine bleeding. He suspected cancer and curetted. The scrapings were sent to Dr. Cullen, who found hyperplasia. Over a series of years this patient was curetted more than a dozen times. Finally Dr. Cullen removed the



Fig. 15.—Hyperplasia in woman of 26, with menorrhagia for two years. Curetted Dec. 15, yielding endometrium illustrated above. Recuretted Feb. 19 for return of bleeding. Endometrium then obtained shown in Fig. 16.

uterus. For a full discussion of the evidence for the ovarian etiology of hyperplasia the reader is referred to a recent paper by one of the present authors (Novak²).

TREATMENT

This subject we shall discuss in only the most summarizing fashion, chiefly because we can add nothing that is new. The therapeutic agencies to be borne in mind are curettage, organotherapy, x-ray or radium, and hysterectomy. Curettage is always an advisable procedure, chiefly for its diagnostic value. Without it, indeed, a diagnosis

is impossible. At times this operation is followed by permanent relief from the abnormal bleeding. In such cases, usually of the milder type, it would seem that the removal of the diseased endometrium has in some unknown way facilitated the restoration to normal of the ovarian function. Such a return to normal no doubt occurs spontaneously in a certain proportion of cases. One at times finds, in taking the menstrual histories of patients, that menstruation is described as having been excessive for the first year or two of menstrual life, and that later the flow has become more moderate, even though no treatment had been given.



Fig. 16.—Showing recurrence of hyperplasia pattern after curetting. Illustration shows typical hyperplasia again on second operation. Patient curetted first Dec. 15, with recurrence of hemorrhage Jan. 21, continuing up to second operation, Feb. 19 (see text).

In most cases, however, relief as a result of curettage is only temporary. At times the bleeding occurs almost immediately after operation. In other cases there is a free interval varying from a few weeks to a number of months. In the interim menstruation may occur quite normally. If bleeding recurs, curettage may be repeated, perhaps several times. This, in young women, is preferable to more radical measures, such as radiotherapy or hysterectomy.

One of the most important points in connection with the whole subject of hyperplasia is that it so often, in a diagnostic way, conflicts with uterine cancer. Both conditions are characterized by bleeding

occurring most often at or near the menopausal age. In the external forms of cancer the distinction is usually easily possible from inspection and palpation. In other cases, however, and of course especially with adenocarcinoma of the fundus, the diagnosis is possible only by diagnostic curettage. The vital importance of the latter in all cases of climacteric bleeding has been emphasized. The fact that it will very often reveal a benign hyperplasia and an absence of the dreaded malignancy will perhaps justify us in placing fresh stress upon this point.

The organotherapy of functional bleeding is still in a very empiric stage, because we know so little of the endocrine disturbance underlying this condition. If the view of Schröder as to the cause is correct, corpus luteum therapy is indicated. The corpus luteum substance should be given by mouth and not in the form of the watery extracts now so generally used hypodermically. The latter are almost certainly inert, as emphasized in a recent study by one of us. The form of corpus luteum extract employed should not have been deprived of its lipoids by degreasing processes, for these are apparently bound up in some way with the active principle (Novak²⁰).

Mention has already been made of the fact that thyroid substance is at times efficacious in checking functional bleeding, while a number of German authors have reported good results from pituitary substance. Either the whole gland substance or, preferably, the posterior lobe extract, may be employed. In the latter case the question arises as to whether the good results may not be due to the increased contraction of the uterine musculature rather than to the correction of the hormone defect.

The question of x-ray and radium therapy in functional hemorrhage has been so much discussed in the past few years that it need only be alluded to here. We are among those who believe that radiotherapy in young women is attended with so much danger of permanent cessation of ovarian function that it should not be employed except as a last resort. We state these views with full deference to the radiologists who have been urging that radiotherapy in small doses is a safe procedure even in young women. In women at the climacteric age, who fortunately constitute the largest group, the problem is an easy one, for radium or x-ray in sufficient dosage will effectively and permanently check the menstrual function and thus relieve the condition.

From what has been said it is evident that the field of hysterectomy is limited to two chief indications, viz., (1) the unavailability of radium, and (2) the existence of associated conditions in the individual case, which make the surgical removal of the uterus preferable to a simple abolition of ovarian function. As we have already explained, a large number of our own cases were subjected to hysterectomy for

this latter reason, the hyperplasia being only an incidental concomitant of other pelvic lesions.

SUMMARY

Hyperplasia of the endometrium, a condition first described by Cullen as far back as 1900, is one of the most important of all endometrial lesions. Clinically its characteristic symptom is bleeding, while pathologically it is characterized by hyperplasia of both epithelial and stromal elements in varying degree and in varying proportion. The glands are of the "swiss cheese" pattern, large dilated glands being found side by side with glands which are small and narrow. The epithelium is at times considerably thickened, while the stroma is often over-abundant and may give evidence of proliferative activity by mitoses.

Grossly the endometrium may be enormously increased in amount, and may present the polypoid picture which has so often been incorrectly described as "chronic polypoid endometritis." In almost half of our cases, however, it was of normal thickness, and in over one-half it was smooth rather than polypoid. The hyperplasia may be localized in uterine polypi, in which case, unless associated with other lesions or with strangulation of the polyp, bleeding has not been a symptom. The hyperplasia pattern is not uncommon with adenomyoma, in either the endometrium of the surface or that of the islets in the musculature.

This study comprises 66 cases of hyperplasia of the uterine endometrium. In 32 cases hysterectomy was performed and in the other 34 our only pathological material consists of uterine curettings. The cases studied were taken in chronological order and selected because of a definite endometrial hyperplasia and not on the basis of the clinical symptoms or signs of abnormal uterine bleeding.

About one-half of our patients with hyperplasia were above 40 years of age while the remainder were in women under the age of forty. The occurrence of hyperplasia in girls near the age of puberty is, in our experience, not common (less than 5 per cent). Our study shows no definite abnormality in the menstrual history of these patients prior to the onset of the symptoms of hyperplasia. With the onset of the symptoms of hyperplasia there was, however, in almost every case excessive menstruation, manifested usually by an increase in both the amount and duration of the menstrual discharge.

Menorrhagia or metrorrhagia may occur as symptoms of hyperplasia, the former being the more common of the two. The passage of blood clots is not unusual. Amenorrhea, as part of the symptom complex of hyperplasia, was noted in about one-sixth of our cases.

Pregnancy occurring after the onset of hyperplasia is uncommon in our study, but did occur in two patients. About one-half of our patients had had one or more full term pregnancies prior to the onset of the symptoms which are associated with hyperplasia.

Schröder believes that an absence of corpora lutea in the ovaries is a characteristic finding with hyperplasia. We have found some exceptions to this rule, so that the matter needs further investigation. The characteristic gland pattern is attributed by some merely to epithelial hyperplasia, and by some to simple cystic distention, while to us the evidence suggests that an enormous overgrowth of the basal layer of the endometrium and an absence of the superficial functioning layers is sufficient to explain the characteristic picture.

✓ The therapeutic measures to be considered for the relief of the uterine bleeding associated with hyperplasia are curettage, organotherapy, radiotherapy and hysterectomy. There are probably a certain number of mild cases which get well spontaneously. Curettage is necessary to make a diagnosis, and may bring about relief of symptoms. Recurrence of the bleeding within a comparatively short time is more common, and repeated curettage may be necessary in the case of young patients where both radiotherapy and hysterectomy are undesirable. At the menopausal age the bleeding can be checked by sufficient dosage of either x-ray or radium. Hysterectomy is reserved for intractable cases where radium is unavailable, or where associated lesions make laparotomy preferable to simple abolition of the menstrual function.

The most important clinical group of hyperplasia cases—and the largest one—is that occurring at or near the menopausal age. The importance of the condition at this age lies in the fact that it is brought into diagnostic conflict with cancer. While it is still true that climacteric bleeding should be looked upon as of cancerous causation until this assumption is disproved, the fact remains that in many cases the cause will be revealed as hyperplasia, a benign condition with no tendency toward malignancy. This is an important point to impress upon those interested in educating the laity on the early recognition of cancer, for there can be no doubt that not a few women with climacteric bleeding delay seeking medical advice through dread of being told that cancer is the cause of their symptoms. Any element of justifiable hopefulness that can be injected into the situation will be of material aid in the cancer education of the public.

In conclusion, the authors wish to express to Dr. Thomas S. Cullen, the head of the department, their appreciation of the privilege of making this study. To Mr. Herman Schapiro they are indebted for the excellent photomicrographs.

REFERENCES

- (1) *Norak*: Amer. Jour. Obst., 1917, p. 75. (2) *Norak*: Jour. Amer. Med. Assn., 1920, lxxv, 292. (3) *Cullen*: Cancer of the Uterus, 1900, p. 479. (4) *Seanzoni*: Die chronische Metritis. 8°. L. W. Seidel & Sohn, Wien, 1863. (5) *Olshausen*: Ueber chronische, hyperplasierende, Endometritis des Corpus Uteri (Endometritis fungosa). 37 pp., 1 pl., 8°, Berlin, 1875. (6) *Brennecke*: Arch. f. Gynäk., 1882, xx, 445. (7) *Cullen*: Ann. Gyn. and Pediat., 1904, xxvii, 413. (8) *Cullen*: Adenomyoma of the Uterus, 1908, p. 180. (9) *Cullen*: Canad. Med. Assn. Jour., 1913, iii, 658. (10) *Schröder*: Arch. f. Gynäk., 1915, p. 104. (11) *Driesen*: Zentralbl. f. Gynäk., 1914, xxxviii, 618. (12) *Meyer*: Arch. f. Gynäk., 1920, lxxxiii, 259. (13) *Seitz*: Zeitsch. f. Geb. u. Gynäk., 1921, lxxxiii, 668. (14) *Seitz*: Arch. f. Gynäk., 1922, cxvi, 252. (15) *Büttner*: Arch. f. Gynäk., 1910, xcii, 781. (16) *Norak and TeLinde*: Bull. Johns Hopk. Hosp., 1923, xxiv, 289. (17) *Casler*: Surg., Gynec. and Obst., 1920, xxxi, 150. (18) *Martizoff*: Bull. Johns Hopk. Hosp., 1923, xxiv, 141. (19) *Williams, W. L.*: The Diseases of the Genital Organs of Domestic Animals, pp. 856, Ithaca, N. Y., 1921. (20) *Norak*: Endocrinology, 1922, vi, 591.

(For discussion, see page 506.)

REPORT OF SOME OBSERVATIONS OF THE EFFECTS OF RADIUM THERAPY IN CASES OF LARGE UTERINE FIBROIDS*

By CURTIS F. BURNAM, M.D., BALTIMORE, Md.

RADIUM therapy has not won the reputation in the treatment of large uterine fibroids that it has achieved with small ones. This notwithstanding the fact that operation is on the average relatively more difficult, and general complications contraindicating operation more common in the former than the latter group of tumor cases. No doubt uncertainty in diagnosis without exploratory operation, apprehension as to the effectiveness and permanency of radium treatment, and fear of general unknown bad effects have all contributed to this state of affairs.

A large pelvic-abdominal tumor demands for definite diagnosis as to source and nature the services of a first-class gynecologist and the use of anesthesia, curettage, and the sound in many cases. Wherever it is impossible to determine that fibroid and only fibroid is present, decision as to treatment should be in favor of operation. This of course means that a surprising number of fibroids which might perhaps be equally well, or better, treated by radium, if one could only be sure of the diagnosis, belong unquestionably in the operative list. There are certain patients too ill for anesthesia or operation where the radium, even without a positive diagnosis, should be employed, as the only thing that can be at all safely done. Complicating inflammatory trouble is a contraindication to radium and especially to intrauterine application of radium.

While anemia constitutes the chief clinical picture of small uterine

*Read at the Forty-ninth Annual meeting of the American Gynecological Society, Hot Springs, Va., May 15-17, 1924.

fibroids demanding treatment, to it must be added pressure and discomfort in the case of large tumors. The physician is confronted by the problem of removing a tumor as well as curing anemia and improving general health. So far as bleeding is concerned, radium treatment is just as certainly and rapidly effectual in large tumors as in small ones, nor are the discomforts and complications following treatment any commoner or any more pronounced in the first than the latter group. Amenorrhea from a single or series exposure can be obtained in all cases within eight weeks, and in many instances follows directly on the treatment. The patient needs to be in bed only a day or two unless there is very pronounced anemia, in which case rest in bed, iron, and even transfusions may be indicated. As a rule the pick-up in general health is quite rapid and this is independent of the effects on the tumor. Exceptions are those cases where long hemorrhage has led to a condition of aplastic bone marrow, as evidenced by absence of blood platelets, reduction of the white cells to below 3,000 and marked anemia. It should be remembered in such conditions that radiation can be given without in any way adding injury to the hemopoietic system but that it will not by itself rejuvenate it. This can be accomplished only by appropriate medical treatment as already indicated.

What are the effects on a large uterine fibroid so far as removal of the tumor is concerned? No single answer can be given to this question. Certain tumors disappear completely, some within four or five months, and others only after a year or two from the date of treatment. Some tumors are only partially reduced in volume and some practically not at all. The mechanism by which a fibroid is reduced is through the cell nuclei of the tumor. Radiation does not destroy adult cells but does injure the proliferative power of cells in a way which leads to a reversal of normal growth processes. There is of course no autointoxication or other observable effect from the absorption of a fibroid tumor. We are constantly absorbing the decomposition products of cells from all over our bodies. The effect of the radiation is a twofold one; first, indirectly through the ovaries and, secondly, directly on the cell nuclei. I shall not here repeat the evidence that destruction by radiation of the follicular apparatus of the ovary, just as oophorectomy, causes amenorrhea and reduction in uterine fibroids, it is too well known. The direct effect on the tumor is evidenced in many cases which have come under my personal observation. The clearest examples are those reductions in the size of tumors radiated after the menopause and the disappearance of tumors without the disappearance of menstruation. We have repeatedly observed both these conditions.

Why are some tumors reduced and others uninfluenced? There is no adequate answer possible here. In the pathologic studies of fibroids removed by operation after unsuccessful radiation, the strik-

ing observation has been made over and over again, that they differ in no way from other fibroids in their histologic and anatomic characteristics. It is possible to assume that the disappearance of tumors after radiation is due in part only to the injurious effects of the radiation and that in part it is due to resisting substances in the body, and we could assume that the absence or feeble action of these unknown body agents accounts for the failures in some cases of the radiation. It is a fact that there is a very great difference in response to radiation of almost every known type of tumor in whatever part of the body found. We must assume either that some such bodily protective mechanism is active or that there is great difference in the chemical constitution and viability of tumors of the same type. The anatomic relations of the tumor, that is, whether submucous, interstitial or subperitoneal, do not seem of importance as indicators of what is likely to happen following radiation. Calcified tumors do not respond favorably so far as diminution in size is concerned. These unusual tumors can all be determined by pelvic skiograms prior to treatment.

Is there a tendency for uterine fibroids removed or reduced by radiation to grow again? A tumor which has completely disappeared rarely, if ever, grows again if a permanent amenorrhea has been established, and usually not if menstruation returns. On the contrary, tumors only partially removed or but little reduced by radiation sometimes grow, even when a permanent amenorrhea has been established, and very frequently if menstruation returns. A second series of treatments and the establishment of a permanent amenorrhea stops growth and causes a further recession of such tumors. In some cases a failure to reduce on the establishment of a complete amenorrhea is due to insufficient radiation. Recently I observed a patient with a fibroid the size of a six months' pregnancy which remained for about nine months unchanged in size, although a complete amenorrhea had been established in eight weeks. A heavy abdominal treatment was given with the effect of a reduction in four months to the size of a three months' pregnancy. The complete disappearance of tumors and the return of menstruation has not been extremely unusual. It may occur as late as four years after the treatment. Our cases have not been thoroughly studied with reference to the question of pregnancy after radiation, but there is one case which I examined carefully and know accurately about, where a sterility had existed for fifteen years, where a fibroid the size of a five months' pregnancy completely disappeared following radiation and where after a two years' amenorrhea the patient began to menstruate again, became pregnant, and gave birth to a healthy child.

In order to formulate an idea as to the percentage of satisfactory results, and as to the permanency of the results, I selected a continuous series of cases upon which we have adequate data, treated in the

years 1918 and 1919. There were 30 cases in all. The tumors ranged in size from a four months' to a seven months' pregnancy. In 15 cases there was a reduction of the tumor to the size of a normal uterus, or of a slightly enlarged normal uterus. In four cases there was a reduction to the size of a six weeks' pregnancy. In none of this group of 19 cases has there been the slightest tendency to regrow; all have with a single exception had a permanent amenorrhea. The menstruating patient is in the thirties, is married, was amenorrheic for three years, and shows no sign of becoming pregnant. Eleven cases were unsatisfactory so far as reduction of the tumor was concerned, there occurring only partial or no reduction whatever. In all 11 of these a complete amenorrhea was obtained. In one case after three years there was a return of menstruation and an increase in the growth; in another, where they had been no reduction of the growth from radiation, after two years the tumor started growing. In both these patients resort was had to abdominal hysterectomy. No serious difficulties were met either in the operation or in the subsequent convalescences. The other nine patients are in very good health but still have their tumors. In none of these cases was there any immediate or late complication either causing discomfort or threatening in any way, and this, as I have already said, is the general rule. In more than 1,000 intrauterine radiations for fibroid or bleeding, there has not been a single death, or for a number of years a single case of lighting up or developing of an infection. We did meet with this in some of our earliest cases when we did not fully appreciate the importance of excluding the inflammatory adnexal cases from intrauterine radiation.

In the radiation of large fibroid tumors it must be borne in mind that considerably heavier treatment must be given than in the small fibroids and menorrhagia conditions. For a number of years our standard intrauterine dosage to produce a permanent amenorrhea has been $1\frac{1}{2}$ gram hours. This applies only to small fibroid uteri and it should be understood that even in these a permanent amenorrhea is obtained by such dosage in only 80 per cent of the cases. It does lead to an amenorrhea of at least a year in nearly all cases. I do not believe that it is possible to absolutely interchange intrauterine dosage on a gram hour basis independent of the varying quantities of radium and time employed. Each operator should determine with his own apparatus what his exact dosage is. We have used radium emanation in small glass bulbs about $1\frac{1}{2}$ mm. in diameter. These bulbs are placed in small brass tubes 1 mm. in wall thickness and about 5 mm. in length. Three of these tubes are placed in a larger brass tube with walls 1 mm. thick and which is conveniently fitted with a uterine sound handle. This apparatus is sterilized and coated with beeswax, which reduces the secondary Beta and K-radiation from the brass. In a series of 35 cases of young women under 25 years of age,

$\frac{3}{4}$ of a gram hour radiation with this apparatus had not produced a single case of permanent amenorrhea. Where the uterine cavity is long, as is often the case in the large fibroids, two or three different portals can be used by moving the sound, and a treatment of as much as 3 gram hours' radiation given without any bad effects. Using a distance of 3 inches and radiating the pelvis through lateral portals over either ovary for a total of 10 gram hours, has almost the same effect as the 1,500 mc. hour intrantrine treatment. Where there is a large fibroid, but a short uterine cavity, it is really indispensable to add external radiation to the intrauterine treatment.

It is also possible, using a uniform distance of 3 ins. and multiple portals, to give as much as 30 gram hours' radiation to a large fibroid tumor without any apparent injurious effect on intestines, on the condition of the blood or on the blood pressure. Radiation of this type should be reserved for large tumors in which the presence of a fibroid in the cervix makes intrantrine treatment difficult or even impossible. As a rule gas anesthesia is employed for dilating the cervix and introducing the radium. Our average intrauterine carrier contains $1\frac{1}{2}$ grams equivalent of radium emanation, so that this treatment lasts for from $1\frac{1}{2}$ to 2 hours in these cases. It takes about 5 hours to give the full 20-gram hour external dosage and this is better done in two or more sittings, as it is less trying on the patient and equally effectual. The Hegar dilators have been found to be very much more satisfactory than the Goodell type for preparing the cervix for the introduction of the radium. I am inclined to believe that they are very much better for all kinds of cervical dilatation. In most persons individuals, if there is any indication against gas, it is possible to carry out both intra- and extrauterine treatment without much discomfort.

SUMMARY

More than 50 per cent of large uterine fibroids can be made to disappear completely by appropriate radium radiation. This can be accomplished at practically no risk to the patient, with very little discomfort, and with little loss of time from the ordinary duties of life, and without in any way complicating operative procedures, should they develop to be necessary later. With these facts in mind the risks of operative interference in cases with heart, renal, metabolic and other general complications, should be carefully weighed in deciding on treatment. My impression is that the amount of dosage necessary to produce a satisfactory result is in no way dependent on the age of the patient. It is possible in some cases of large fibroids to remove the fibroid completely and to preserve both the power of menstruation and reproduction. This has a particular interest in the younger, healthier women.

ETHYLENE AND OXYGEN ANESTHESIA FOR GYNECOLOGICAL AND OBSTETRICAL WORK*

BY N. SPROAT HEANEY, CHICAGO, ILL.

IN 1915⁴ I had the honor of presenting the first paper read before this Society on the conduct of labor under nitrous oxide and oxygen, so that today I am especially pleased that I have the privilege of relating to you our experience with ethylene and oxygen anesthesia. Soon after Luckhardt and his associates demonstrated the physiologic effects of ethylene and oxygen upon laboratory animals and upon man, we began the surgical use of this anesthetic in the wards of the Presbyterian Hospital, Chicago. From this source Luckhardt and Lewis,³ and Kretschmer⁵ have already reported their gratifying results. We have used ethylene and oxygen in our service now somewhat more than a year and have the records of 338 administrations without the addition of ether and 111 administrations with the admixture of ether in the gynecological operation room; and 231 administrations without ether in the obstetrical wards. In addition we have given it many times to the ambulatory case to obviate otherwise painful manipulations.

It is an agent without equal for diagnostic examinations under anesthesia. Nitrous oxide too frequently does not relax, while ether is too lasting in its effects to make either anesthetic satisfactory in the examining room. Ethylene and oxygen puts the patient quickly to sleep, gives complete relaxation without jactitation or asphyxia, produces little or no sweating, has almost, if not quite, as rapid a recovery stage and no more nauseous sequelae than has nitrous oxide.

Without the addition of ether it has been entirely sufficient for all operations attempted from below. Vaginal hysterectomies, interposition operations, hemorrhoidectomies, prolapsus operations, extensive vaginal plasties have all been performed with the same ease as under ether anesthesia.

The anesthetist must be more watchful with ethylene than with ether if the anesthesia is to be smooth and even. While not demanding quite the knack in administration as does nitrous oxide, still much the same special adaptability must be present in the anesthetist to administer ethylene and oxygen satisfactorily for long periods of time. On our service the anesthetic is administered by an interne, so that we have given ether admixture for abdominal operations more

*Read at the Forty-ninth annual meeting of the American Gynecological Society, Hot Springs, Va., May 15-17, 1924.

frequently than was employed for similar procedures on services in the hospital where professional anesthetists were employed. Ethylene has been sufficient for about one-half of the pelvic operations performed in Trendelenburg position. When the patient has been fat, the pelvis deep, or much protective packing has been done, ether frequently had to be added. When once, however, the anesthesia becomes sufficiently profound, it is usually possible to discontinue the further addition of ether. Where ethylene suffices, however, abdominal packs are rarely required because the respirations are not exaggerated as under ether, but are of approximately normal rate and depth, and the intestines do not incline to wave back and forth through the abdominal opening. Despite prolonged administrations the patient is always conscious before leaving the operating room.

Ethylene and oxygen are of especial benefit to the patient who is a peculiar surgical risk, as has been shown by Kretschmer⁵ in urologic cases and Lundy⁷ on infants with obstruction of the pylorus. Ethylene has little or no effect upon the blood pressure. It is not a pulmonary irritant. Leake and Hertzeman⁸ have shown that "ethylene like nitrous oxide, does not influence the blood reaction as markedly or as rapidly as ether." We have operated the diabetic, the nephritic, and patients with bad hearts without discoverable deleterious effects. Where we formerly operated the feeble old lady with prolapsus under local anesthesia, we now use ethylene and oxygen with better results, since we operate more skillfully and the patient escapes the anxiety and fatigue that accompany operations under local anesthesia, particularly in the lithotomy position.

In the delivery room we now administer ethylene as routine for the conduct of labor. Susceptibility varies, but as in surgical work, 80-90 per cent ethylene is ordinarily used at the beginning of the administration. This mixture can usually be thinned down as the labor progresses. We aim always to give the thinnest mixture necessary to produce satisfactory results. Two inhalations are usually sufficient to produce analgesia. While hallucinations occasionally occur, they are not nearly so common as with nitrous oxide. Between pains the patient is ordinarily quieter than with nitrous oxide and does not complain so loudly of not getting the gas fast enough at the onset of a pain. Where with nitrous oxide we were in the habit of admixing ether for the last two or three pains preceding the delivery of the head, with ethylene we find ether unnecessary.

Early in our experience we thought that ethylene probably decreased the frequency and intensity of the pains somewhat, but after having made careful observations upon numerous cases where we alternated, using separate machines, ethylene with nitrous oxide for periods of from fifteen to thirty minutes, we are convinced that when given in proper concentrations, there is no appreciable difference in

effect. When nitrous oxide is used, ether must be added for all except the most trivial repairs. With ethylene no ether is necessary for even the most extensive obstetrical operations. Vaginal cesarean sections, difficult forceps operations, versions and extractions, repairs of complete tears, and manual removal of the placenta can all be done as satisfactorily under ethylene as under ether. If inexperienced anesthetists are used, ether is more comfortable for the operator in situations where considerable confusion is liable to occur, since, as mentioned before, more attention to the task is required to give a satisfactory ethylene anesthesia than is requisite with ether. The patients who have had ethylene remember less concerning the labor than they usually do after nitrous oxide.

The jeopardized patient requiring cesarean section will best be served by the use of ethylene. The quickness of the induction, the freedom of straining and asphyxia are very important recommendations in such cases. The child cries promptly and the uterus behaves as when nitrous oxide is given. When ethylene is administered, the blood has a peculiar pink color and there is more capillary spurting than ordinarily. These phenomena disappear with cessation of the anesthetic. There is more bleeding from the empty uterus under full anesthesia with ethylene than with nitrous oxide, but very much less than with the evanescent ether. No effects upon the hemoglobin of mother or child, or upon the heart or kidneys of either, have been discoverable after the use of ethylene.

Ethylene has to many a very disagreeable odor. This is mentioned particularly by the bystander who gets only whiffs of it, but is rarely spoken of by the patient who gets the gas in such concentration that her sense of smell does not have much chance to annoy her. Ethylene is highly explosive, particularly when markedly diluted with oxygen. In our administrations we have studiously avoided flames, cauteries, and all such possible sources of ignition. In spite of this we have had two violent explosions. Though approximately 3,000 administrations of ethylene have been given by several different anesthetists in the different operating rooms of the Presbyterian Hospital, the only two explosions which occurred were in the same delivery room and with the same man at the gas machine. Both were static in origin. In the first instance at the conclusion of a pain the mask was hooked over the mixing chamber. At the moment of contact there was a terrific report, the glass cover of the mixing chamber was blown to dust, and a flame spurted from the chamber, which died out as soon as the ethylene was turned off at the tank. A second explosion occurred several weeks later. The machine had just been used for an ethylene and oxygen anesthetic (without ether) in the operating room and had been wheeled to the maternity for use during an examination in the delivery room. The gas was again turned on and the anesthe-

tist stood at the head of the delivery table with the mask in his hand awaiting the work to start the administration of the gas, when the explosion occurred. Though not certain, he thinks he may have struck the delivery table with the gas mask. In all other particulars the circumstances were the same as the first explosion, and aside from the anesthetist receiving trivial cuts from the flying glass, no harm was done.

We had a similar explosion two or three years ago after an administration of ether mixed with nitrous oxide and oxygen. The machine had been left standing after the conclusion of an operation when a nurse, in passing, touched the machine and gave the static spark with a result similar to the ones described above. We hear through the manufacturer of a popular gas machine that from one cause or another explosions are not at all uncommon when ether is used in gas machines, that probably one hundred explosions occur each year. Luckhardt after consultation with physicists warns against the very real danger of the repetition of such accidents with possible serious results and offers the following suggestions for the avoidance of this danger: First, that the mask tubing be made of flexible metal instead of rubber, or if this does not make a good mechanical job, that a spiral coil of wire be placed inside the rubber tubing so as to make a continuous metallic contact from mask to gas machine and to the tank, that the tank itself be grounded by means of a conductor such as a wire attached to a radiator or a water pipe; and that the inner surface of the rubber mask be lined with wire gauze which, in turn, should be in contact with the metallic tube conducting the gas mixture to the mask.

We did not stop the administration of ethylene after the first explosion since it seemed a freak accident and not liable to be repeated under any circumstances if we simply refrained from hooking the mask over the mixing chamber. Repetition of this previously unreported accident left us so perturbed, however, that until Luckhardt's suggestions for remedy were carried out, we discontinued the use of this valuable anesthetic in the gynecological and obstetrical wards. Ethylene is again as popular as ever and is given with daily increasing enthusiasm.

REFERENCES

- (1) *Luckhardt and Carter*: Jour. Am. Med. Assn., 1923, lxxx, 1440. (2) *ibid.*, 1923, lxxx, 765. (3) *ibid.*, 1923, lxxx, 1851. (4) Trans. Am. Gynec. Soc., 1915, 91. (5) Jour. Urology, April, 1924. (6) *Horsley*: Virginia Med. Month., 1924, 1, 822. (7) Jour. Am. Med. Assn., 1924, lxxxii, 448. (8) Jour. Am. Med. Assn., 1924, lxxxii, 1162. (9) *Christiansen*: Ethylene-Oxygen Anesthesia in Exodontia, Dental Cosmos, March, 1924. (10) *Heaney*: Surg. Gynec. and Obst., 1924, xxxviii, No. 5.

MENTAL DISEASES ASSOCIATED WITH CHILDBEARING*

By MENAS S. GREGORY, M.D., NEW YORK, N. Y.

(*Director Psychopathic Department, Bellevue Hospital; Professor of Psychiatry, University and Bellevue Medical College.*)

THE mental disorders associated with childbearing are especially important as well as profitable for discussion for the following reasons:

First. The family physician is the first to come into intimate contact with the obvious mental disorders of the puerperium, concerning which there exists a very widespread misapprehension; particularly the misconception that these mental disorders are directly due to puerperium.

Second. The attending physician must assume a great deal of the responsibility, for, in many instances, the occurrence of a psychosis at this time is erroneously attributed to mismanagement of the labor.

Third. The mental diseases occurring at this period are especially distressing, as the welfare of both mother and child are involved.

Fourth. As many of the mental upsets of childbirth are of transitory and recoverable character, there is great danger that the attending physician may be incautious in giving too hopeful a prognosis, unless he recognizes the very great diversity of these mental conditions.

Fifth. There is a total lack of interest and almost inherent indifference on the part of the medical profession to the mental condition of the mother during pregnancy and puerperium, and its possible relation to the development of mental upsets occurring at this time.

Finally, the discussion and analysis of the mental disorders occurring during childbirth offer an excellent opportunity to demonstrate the trend of present day psychiatry, and show the inadequacy of the older viewpoint, under which many dissimilar mental disorders were grouped as one. This attitude of mind became an obstacle to the growth of truth and harmful to the progress of psychiatry.

A very brief survey of the history and evolution of psychiatry will be of great aid to an intelligent study of the psychoses of the puerperal state.

As is well known, the healing art in ancient times was intimately connected with religion; the priestly class arrogated to themselves the healing of the sick, in addition to their purely spiritual functions. As both sacred and profane history show, the priests of Isis and Osiris, in ancient Egypt and of Esculapius in Greece, and the prophets of

*Read at a meeting of the Obstetric Section of the New York Academy of Medicine, April 22, 1924.

Jehovah in Judea, claimed power over diseases, which were regarded as an expression of the wrath of a god, or the malevolence of an evil being.

However, as magic, superstition and ignorance gave way to knowledge, experience and scientific observation, the nature of disease was better understood and it came to be regarded as an abnormality of the body.

It was in ancient Greece, more than 400 years before the Christian era, that Hippocrates first recognized that disease, physical as well as mental, was due to changes in the body and the brain and was not the result of demoniacal possession, as had previously been held. We find astonishingly accurate descriptions and understanding of mental diseases in the writings of the immediate followers of Hippocrates, and especially in those of Aesclepiades, whose recommendation of hydrotherapy, occupation and lack of restraint in these mental conditions has a decided modern flavor.

It is scarcely necessary to dwell upon the fact that, during the dark ages, and as a result of great religious enthusiasm, the primitive spiritual conception of diseases was again revived, and that the application of this theological point of view to the study and practice of medical science almost undid the work of Hippocrates and his disciples.

If this spiritual conception of physical diseases was more or less prevalent during the Middle Ages, it can readily be imagined how much more this idea, stimulated as it was, by the literal interpretation of Biblical references, influenced the viewpoint of mental diseases.

Suffice it to say, without going into detail, that in the beginning of the nineteenth century, although medical science in other branches had made great advances, psychiatry, burdened with the fetters of this old theological viewpoint, remained centuries behind.

To Pinel belongs the credit and glory of having blazed a new trail. Departing from the traditions and superstitions of the past, he applied the scientific method of observation and generalization to the study of psychiatry,—those methods which had made great progress possible in other branches of human endeavor.

His generalizations, however, were of a very elementary character. As there was not as yet a sufficiently large accumulation of observations and facts, his groupings were naturally crude and inadequate. He based his classifications and groupings on a few and apparent symptoms, such as emotional disturbances and behavior of the patient. Those who were excited were grouped under "mania"—those who were sad under "melancholia," and those who were dull and apathetic under "dementia." His manias included mental excitements of all sorts,—alcoholic, epileptic, parietic, as well as dementia precox and

manic depressive. The melancholias likewise embraced depressions of a widely different character, such as might occur in various and quite dissimilar psychoses.

However, Pinel was not working alone. A widespread interest in psychiatry now pervaded the whole civilized world; contemporaneously and immediately after Pinel, there arose many earnest workers in this field, such as Esquirol in France, Connolly and Tuke in England, Jacobs and Heinroth in Germany and Rush in this country, who jointly laid the foundation upon which modern psychiatry rests.

As experience soon demonstrated the inadequacy of these elementary groupings, repeated attempts were made to reclassify and regroup mental diseases from various standpoints.

Almost every conceivable viewpoint was made the basis of a generalization, such as the age of the patient, physiologic epochs, bodily functions, striking symptoms of various kinds, dangerous traits, such as homicide and suicide,—the seasons of the year, the phases of the moon, and a host of other irrelevant and incidental factors. Thus it came to pass that the mental disorders at puberty were called insanities of adolescence; those occurring in old age, senile insanities. Because masturbation was the striking symptom in some patients, these were grouped under the term masturbational insanity; patients with delusions of a religious cast were said to be affected with religious mania, or religious melancholia. Thus homicidal mania was spoken of. There was assumed to be an insanity of the menopause.

And, along similar lines of reasoning, the mental disturbances occurring with the phenomena of childbearing were termed "puerperal insanity."

Thus arose this illogical view of the situation, which has persisted, strange to say, even to the present day. No doubt this may be partly attributable to the very intricacy of the subject, and partly to the indifference which the great mass of the medical profession has displayed toward mental diseases.

However, in the earlier half of the nineteenth century, isolated observers materially contributed to the advance of psychiatry. Chaos and confusion still prevailed, until late in the nineteenth century, when the various German and French schools of psychiatry first endeavored to clear the situation. There arose earnest workers, such as Falret, Bayle, Hecker, Kahlbaum, Kraepelin, and many others. Among them, however, the name of Kraepelin stands in greatest prominence; because it was he who first forcibly pointed out the illogical and unreasonable viewpoint of classifying mental diseases from a few general symptoms, from incidental associations and from the observation of the disease for only a short period of its course.

He insisted that the grouping of mental diseases must be along

lines similar to those of physical diseases; that it would be as equally absurd to maintain that the mental disturbances occurring in the young were adolescent insanity, irrespective of other conditions, as to state that every exanthema occurring in childhood was measles; that in the grouping and studying of mental diseases, the whole life history of the disease,—its etiology, onset, course, symptoms and outcome, must be considered.

This criterion, simple as it appears, is the keystone of present day psychiatry, and, more than any other factor, has contributed to its rapid progress in the past twenty-five or thirty years.

The terminology of modern psychiatry, like that of physical diseases, is no longer descriptive of any one of the several symptoms which may arise in that disease, but rather a label for a clinical entity, which has reference to the disease picture in its entirety.

For example, dementia precox does not mean an early or precocious dementia, but rather stands for a clinical type, beginning insidiously, having a long and definite course, and terminating unfavorably.

I have, perhaps, dwelt at greater length on the evolution and fundamental principles of modern psychiatry than the title of my paper justifies. However, I have purposely done so, even at the risk of digression, in order to emphasize the criteria which the modern school of psychiatry deems absolutely essential in the study and grouping of mental diseases.

With this explanation, let us now discuss the following clinical data regarding the psychoses associated with childbearing, in accordance with the criteria insisted upon above.

The clinical material upon which these data are based, consists of one hundred and eighteen cases, the majority of which passed through the psychopathic wards of Bellevue Hospital and some who were seen in private practice.

Only cases admitted during the years 1914, 1922, and 1923, were taken from the hospital records. This was done to eliminate error as far as possible, so that the course and termination of the psychoses could be investigated, and the diagnosis checked with subsequent observation in the state hospitals to which these patients had been sent.

Group I.—Of these 118 so-called puerperal cases in the series, manic depressive psychosis appeared fifty-two times, more than forty-two per cent.

Manic depressive psychosis is a constitutional disorder, which manifests itself in longer or shorter attacks of excitement or depression, and which has a marked tendency to periodicity. It has a definite mode of onset, symptomatology, course and favorable termination. Of its etiology we are, unfortunately, in the dark, except that heredity

plays a predominant rôle, appearing in almost fifty per cent of the cases. It is equally frequent among men and women and may occur at any age; the youngest patient I have seen being ten, and the oldest a man of seventy-six. While the individual attack may be precipitated by any severe emotional stress or physical exhaustion, it may occur at times without any apparent cause. Grief, worry, fright, disappointments of various kinds, physical exhaustion, toxemias, infections, and a number of similar conditions have been assigned as exciting causes.

Of the manic depressive series, twenty-one suffered from the excited phase, nineteen were of the depressed type; nine were of the mixed phase, and three of the circular type.

Of the whole group, four arose during the latter months of pregnancy, one during lactation several weeks after delivery, and the remaining cases occurred in the puerperium.

Eighteen of the patients were primiparæ; the youngest was eighteen and the oldest forty. In only six cases was the labor recorded as being difficult, and in four cases there was sepsis. Other exciting causes assigned were fright, illegitimacy (in three), domestic infelicity, sexual maladaptation, anxiety and sudden death of husband.

In thirteen patients there had been previous attacks not coincident with childbearing, and in two patients, repeated attacks occurred in successive childbirths, one having three attacks with three consecutive births.

Of this group, five died of intercurrent diseases. All the remainder recovered except seven, who are still under treatment in state hospitals and have greatly improved.

Heredity was an established factor in twenty cases. The duration ranged from one to eighteen months and several have had subsequent attacks of psychosis of similar type.

These statistics have been given at length mainly to emphasize the fact that this disease may, and frequently does, occur independently of the puerperium, and, after all, in many cases its occurrence here is purely coincidental and in only a comparatively few cases, as most of the labors were uneventful, might the birth be said to have been the precipitating cause of the psychosis.

Group II.—The second group comprises dementia precox, of which there were eighteen in the 118 cases under discussion.

Dementia precox is a slowly progressing, deteriorating mental disease, which ends unfavorably. It begins usually at adolescence, although the onset may be observed as late as the forties. Men and women are equally affected. While the etiology of this disease is not definitely settled, it is a common and well-defined clinical entity with protean symptomology and definite course and termination,—a disease entirely independent of childbearing, although at times the onset

may be precipitated by pregnancy or childbirth, particularly the catatonic form.

Careful investigation will generally show, however, that the majority of such cases develop insidiously during pregnancy, and even before, and that childbirth may accentuate the symptoms which were previously unnoticeable to the relatives.

All of these cases on admission were said to have had the onset during the puerperium, but on closer investigation, it was ascertained that in six of the series of eighteen cases, the disease had lasted some years prior, in milder form, and only became aggravated.

Without further burdening you with statistics, I might say that some were excited and restless and others exhibited apparent depression. Under the older viewpoint, because of this excitement and depression, some would have been termed puerperal mania, and some puerperal melancholia, which would have allied them, among other conditions, to the psychosis of the manic depressive group, from which they are fundamentally different, and to which they have merely a superficial resemblance.

Group III.—As a third group in this series, might be mentioned three cases of epileptic psychosis. All of these three patients had been suffering from epilepsy for years, and, at various times in the course of their illness, they had suffered mental upsets incident to their sickness, namely, postepileptic mental excitement and confusion, psychic equivalents, etc.

It is scarcely necessary to state that epileptics are subject to mental disorders of this kind, and that such condition has no direct connection with childbearing. As the case was in these three patients, their mental disorder was due to epilepsy, from which they had been suffering, and all that can be said of its relation to the puerperal period, is that the latter might have acted as a provocative factor. All of these patients, of course, made a complete recovery from their psychosis.

Group IV.—There was one case of alcoholic insanity in the series, of polynuritic type. She recovered, and, of course, her psychosis had no causal relation to the puerperium.

Group V.—The fifth group comprises four cases, classified as psychosis with intellectual inferiority and mental deficiency.

This mental condition may be defined briefly as a transitory upset in individuals who are not of strong mental endowment, such as unstable, "near" normal individuals, and high grade mental defectives. Their mental upset is the direct result of their inability to properly adjust themselves in the face of unusual difficulties.

The history shows in these cases that they suffered from mental conflicts during the pregnancy, such as illegitimacy, fear and appre-

hension regarding the outcome of confinement, etc. Mental conditions similar to this also appear independently of childbirth, and are especially common in men, showing that they are not in any sense puerperal. All of these cases recovered from their psychosis and regained their former mental health, namely, that of inferiority and of mental deficiency.

Group VI.—The sixth group of the series comprises thirty-one infective exhaustive cases, of which three occurred during pregnancy, five at the time of labor, and the remainder during the puerperium. This group of mental diseases has a well-defined etiology, and might be said to be clinically closely allied to delirium.

The prominent symptoms of this mental disorder are confusion, disorientation and multiple and combined hallucinosis. Apprehension, depression, anxiety, excitement and restlessness may be present, but are of secondary importance. These psychoses are caused by infections, toxemias and exhaustion. The intensity of all these symptoms depends on the degree and character of the poison, and to some extent on the susceptibility and physical condition of the patient. It is needless to say that it may occur in any individual who may be exposed to these conditions. A large proportion of the admissions to the psychopathic wards belong to this class, among men as well as women.

The prognosis is favorable as to mental recovery, but death frequently occurs from exhaustion. Nine of this series of thirty-one died, nineteen recovered and three were discharged improved. There were five primiparae, and two were illegitimately pregnant. Four of the cases were eclamptic. Four had postpartum hemorrhage and six had well marked sepsis.

It is interesting to note that the majority of these cases had psychic conflicts, such as worry, fear, domestic and economic difficulties, etc., during pregnancy. It is in this group that the puerperium has a most direct causal relation to the psychosis, inasmuch as the phenomena of childbirth directly gave rise to conditions which were etiological factors. In other words, exhaustion and infection were directly dependent on the childbirth; although this, too, is a distinct psychosis, which may occur independently of childbearing, in women as well as men.

Group VII.—The last group in the series consists of five cases, all of whom presented a condition of mental upset which we designate under the term "transient attacks of excitement and confusion."

Clinically, these cases are closely allied to the infective exhaustive group, but I would like to discuss them separately, for two reasons: First, because the duration of the attacks is very brief, varying from a few days to a week; second, and much the more important, these

cases differ somewhat from the infective exhaustive group, in that the psychic or psychogenic factors overshadow the physical which give rise to the psychosis.

All of the patients in this series had, during pregnancy, been troubled with fear, worry, anxiety, uncertainty, and other conflicts of various sorts. One patient was told just before she was confined that she might become crazy; another was in fear that her child might be born dead. A third, a woman 36 years of age, was overwhelmed with fear that she would surely become mentally upset after childbirth, as she had following each previous confinement. This patient had suffered a mental breakdown after her first confinement, fifteen years ago, which lasted for some months, and which necessitated her commitment to a state hospital. She has had five other children since and has suffered a mental upset of transient character immediately following each labor.

These cases did not present any febrile reactions, nor was there any marked physical exhaustion, or any physical complications in connection with their labor.

The clinical symptoms in these cases were closely akin to a type of transient mental disorder which I reported in a paper some years ago under the title of "Transitory Psychoses" and which were characterized by fear, apprehension, suspicion, disorientation, misinterpretations and illusions, which are of a circumscribed character and refer mostly to immediate surroundings or happenings.

In these cases there was very little physical disturbance, and the content of the delusional misinterpretation was the realization of what the patient had feared, and anxiously anticipated before the onset of the illness. Let me illustrate this with a very brief description of a case:

A mine laborer came to New York from the Pacific Coast, with his savings of three years, amounting to two hundred and fifty dollars, on his way home to Hungary where his wife and six children awaited him. This sum was his entire fortune, and on it depended the future happiness of himself and family. He naturally guarded it very carefully, especially in view of the fact that he had heard that many of his countrymen had been taken advantage of and had had their savings stolen in New York City, by being drugged, etc.

While he was waiting for the steamer, he made the acquaintance of several of his countrymen, with whom he had something to drink, but not to the extent of intoxication. On feeling for his treasure in his pocket, where he supposed it to be, he found it missing, and he suddenly became very excited, going into a condition of frenzy.

On admission, he was in a confused, bewildered state; would not permit anyone to come near him, and insisted that he had been robbed; that he was being pursued; refused to eat and misinterpreted his surroundings; insisted that the doctors and nurses were trying to harm him; and although he was shown his money intact in his clothes, still maintained that he had been robbed and pursued

and that people were trying to injure and kill him. This condition persisted for ten days and when he recovered he had only a vague recollection of the entire episode.

Here we have a mental disturbance of transient character, in which the patient had been, first, in a state of fear and anxious anticipation; second, he had taken alcohol in a quantity not enough to intoxicate, but sufficient to cause a certain psychic incoordination; the result is an emotional upset, characterized by a delusional realization of his fears and apprehensions.

I cite this particular case from a large number in our experience, as it illustrates very clearly the psychologic mechanism of this type of mental disorder in our last group. I might also add that some of the mental upsets following the scopolamine administration in labor, which was in vogue a number of years ago, were of this character.

I have especially emphasized this last group, trivial as it might seem, because of its comparative infrequency and its brief duration, for the reason that it teaches us a striking lesson in mental hygiene of the pregnant mother, to which I shall allude later.

These one hundred and eighteen cases, which were carefully observed, and their subsequent course and termination followed, have shown that the old concept "puerperal insanity," has no reason for existence. In fact, the perpetuation of the term is fraught with danger to the patient, and difficulty and confusion to the physician. No such entity as puerperal insanity exists. There are a number of different psychoses which may coincidentally occur at this time, which are extremely diverse as to their course, outcome and therapeutic possibilities. If the term "puerperal insanity" is permissible at all, it should be limited to the group of the infective exhaustive psychoses, because here only is there a direct and traceable relationship to the outbreak of the psychosis.

But even in this group of cases, the term puerperal insanity would be a misnomer, as infections, toxemias and exhaustions occurring independently of childbirth may give rise to the same train of symptoms.

The diagnostic criteria of modern psychiatry will certainly aid in avoiding many dangers and blunders in prognosis. All the manic depressive group cases terminate favorably, with however, the possibility of recurrence. The dementia precox cases may recover from the episode of excitement and other manifestations, but the underlying split in the psychological process may continue.

We look for complete recovery in the infective exhaustive group, but in some death may occur from physical exhaustion.

Obviously, I cannot go specifically into the details of treatment, except to say, by analogy, that inasmuch as no enlightened physician today treats a cough as a disease independent of whether it is a

tuberculosis, a bronchitis, an asthma, an abscess of the lung, or an actinomycosis, so no scientific physician can any longer treat a puerperal insanity, independent of whether it is a dementia precox, a manic depressive psychosis, an epileptic equivalent, an alcoholic delirium, a toxic psychosis, or whatever other the individual disorder may be.

What, then, is the responsibility of the physician, if these mental disorders are not directly related to childbearing?

Inasmuch as these psychoses are merely incidental, is there not a possibility of a proper mental hygiene during pregnancy, whereby the mental breakdown may be prevented?

While the value of physical hygiene is not to be underestimated, the real preventive work in this field must be along different lines. We must realize that the mind and the mental conflicts of the pregnant mother require as much attention as her body and purely physical functions.

Not only are these patients burdened with the cares of childbearing as a physical process, but many are struggling with enormous tasks of mental adjustment to the thousand and one difficulties of life. Financial stress; economic burdens; unwelcome children; a dull outlook; or a loveless life; drunken husbands; the struggle with cripples in the family; the jealousies and biting bitterness of infidelity; the loss of ideals and the lack of faith;—these, and many other real things,—I might say the *most* real causes of mental breakdown,—are undermining the very foundation of a healthy mental tone.

These are the factors, for the disregard of which we are responsible. While pursuing our scientific examination, even to the extent of a milligram of the nitrogen content of the urine, we overlook the most salient psychic factors, which may precipitate a mental breakdown in our patients.

A sunny room and plenty of fresh air are not going to prevent the outbreak of a psychosis, if the relationship toward the husband, and the outlook for mutual respect and healthfulness are dark and humiliating.

It is of little avail to give generous advice on the matter of physical hygiene, and keep absolutely quiet about rotten social situations. It is true, many of these things cannot be remedied, even by the most tactful and honest and daring of physicians. An eclampsia may occur, despite a thousand urinary examinations, which does not discourage our efforts of treatment. So too, many of these mental conditions cannot be remedied;—such, fortunately, are in the minority,—yet our constant effort must be toward the goal of better mental hygiene.

The doctor must become more than the skilled mechanic,—he must be a mind doctor as well, and when, to his skill and intelligence, he adds these human qualities of clear and comprehensive insight into the mental conflicts of his patients,— he *then* becomes doctor and priest as of old, but with science and humanity as his aids, instead of superstition and reliance upon the miraculous.

(For discussion, see page 516.)

CHORIOANGIOFIBROMA (CHORIOANGIOMA)

BY R. S. SIDDALL, DETROIT, MICHIGAN

From the Obstetrical Department, Henry Ford Hospital

SOLID tumors of the placenta are so rarely encountered that such an experience is in itself of considerable interest. Recently, in the course of the routine examination of a placenta, we found a large chorioangiofibroma, which has been carefully studied macroscopically and histologically. Subsequently, a careful review of the literature was undertaken for the purpose of correlating our knowledge of these tumors. The present article then deals with the specific details of an observed case and a statistical study of 130 others uncovered in previous reports, together with an exposition of the various theories concerning the origin, nature, and etiology of these tumors.

CASE REPORT

Case History.—H. F. H. case number 19967, age twenty-four years, American, white. Previous pregnancies, none. The patient was first seen in the out-patient department on July 7, 1922, at which time there was nothing of significance in the past history, and the pregnancy had been uneventful except for early nausea and considerable flatulence. Onset of the last menstrual period was November 11, 1921, from which the calculated expected date of confinement was August 18, 1922. The general physical examination revealed no abnormality worthy of note. External and internal pelvimetry indicated a normal pelvis. Blood Wassermann reaction was negative with plain and cholesterolized antigens. Observations made at biweekly intervals, until the patient was admitted to the hospital, showed no significant abnormality, urinalyses were negative, blood pressure was never above 130 systolic and 85 diastolic, and the head became engaged in the superior strait early in the tenth lunar month.

The patient was admitted to the hospital on August 19, 1922, and the onset of labor pains occurred the next day twenty-one hours subsequent to spontaneous premature rupture of the membranes. Vaginal examination showed face presentation, right mentoposterior position, but an attempt to convert this to a more favorable position was not made because of the deep engagement. The first stage of labor was completed in four and one-half hours, and a second stage of about three hours resulted in anterior rotation of the chin and spontaneous delivery of a full term male child weighing 3535 grams and in excellent condition. The placenta separated spontaneously and was expressed from the vagina by pressure upon the fundus. About 250 c.c. of blood was lost. The child developed hemorrhagea neonatorum on the second day but was successfully treated by three intramuscular

injections of blood and a blood transfusion. The puerperium was uneventful except for an unexplained temperature elevation to 100.4° on the 5th day, and after two weeks the mother and child were discharged from the hospital in excellent condition.

DESCRIPTION OF PLACENTA AND TUMOR

Gross.—The placenta is irregularly oval in shape, measuring 25 cm. in its greatest length and 20 cm. in its greatest width (Fig. 1). The amnion covering the



Fig. 1.—Placenta showing tumor elevation on fetal surface. (From drawing by Dr. R. E. Wagner.)

fetal surface is greenish in color due to meconium passed by the fetus before birth. The umbilical cord is inserted eccentrically about 4 cm. from the placental margin. Occupying the center of the placenta and directly adjacent to the insertion of the

cord is a mass 10 x 7.5 cm. which is elevated above the fetal surface, making the thickness of the placenta 4.5 cm. at this point as against 2.5 cm. elsewhere. This, the tumor, is covered by amnion, beneath which several umbilical vessels pass from side to side. The mass is somewhat irregular in contour by reason of small nodular elevations, averaging about a centimeter in diameter, which show through the amnion as pinkish areas. On palpation these nodules have a solid, rather than cystic feel and are outlined by broad areas of softer tissue. The maternal

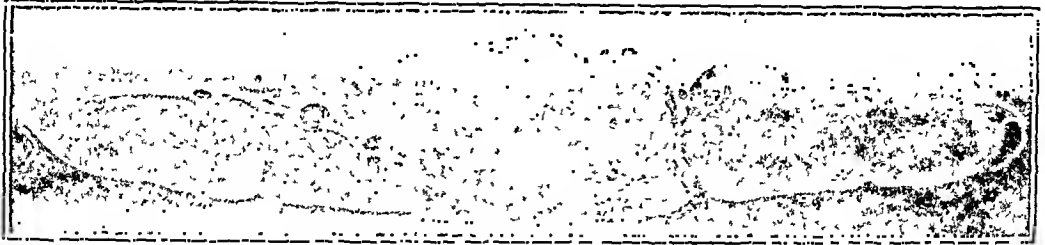


Fig. 2.—Cross section of placenta and tumor. (From drawing by Dr. R. E. Wagner.)

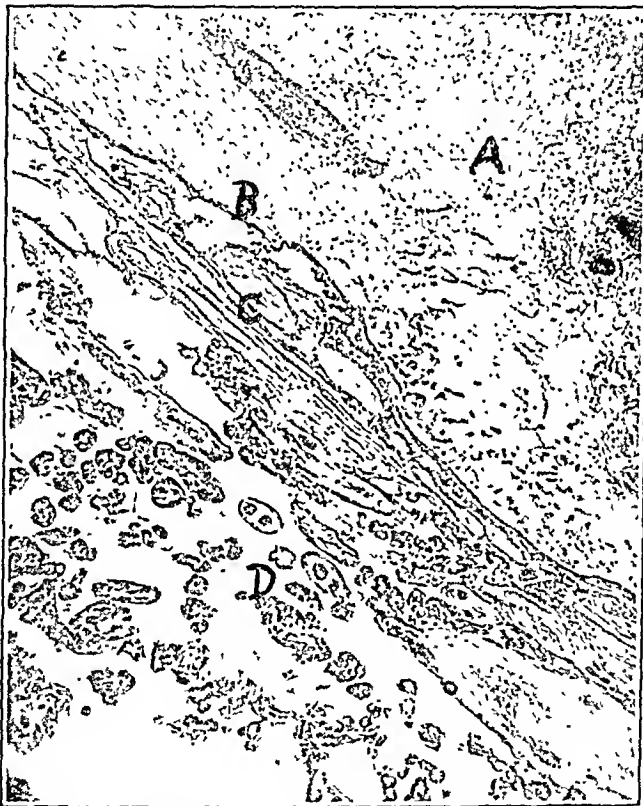


Fig. 3.—At periphery of the tumor. A, tumor; B, epithelium of tumor; C, pseudo-capsule; D, normal villi.

side of the placenta is normal and shows no evidence of the tumor. The cotyledons are well marked and complete.

The placenta is bisected through its long diameter by an incision which passes through the middle of the tumor (Fig. 2). The latter is seen to be discrete and well-defined and seems to be marked off from normal placental tissue by a loose, thin fibrous capsule. The tumor mass does not appear upon either surface of the placenta, being separated from the uterine side by a layer of tissue about 2 mm. thick and from the amnion by a slightly thicker layer. The consistency is fibrous, but many blood vessels of various sizes are cut through. There are a certain number

of partial fibrous trabeculae which divide the tumor incompletely into irregular lobes. There is a tendency for the larger vessels to run in the trabeculae. The lobes for the most part appear to be made up of fibrous tissue in which lie many small vessels, though in certain small areas the tissue seems to be almost exclusively fibrous. The point of attachment and vascular connection of the mass to the placental tissue is not searched for; but, after securing sections for microscopic examination, the whole placenta is preserved in Kaiserling's solution.

Microscopic Examination.—The tumor is seen to be composed of the same tissues as are normal villi,—connective tissue, blood vessels, and epithelium,—and, in general, the fundamental tissue elements, the cells, are not appreciably different. However, the relative proportions of the tissues and their relations to each other result in a structure which is distinctly abnormal.

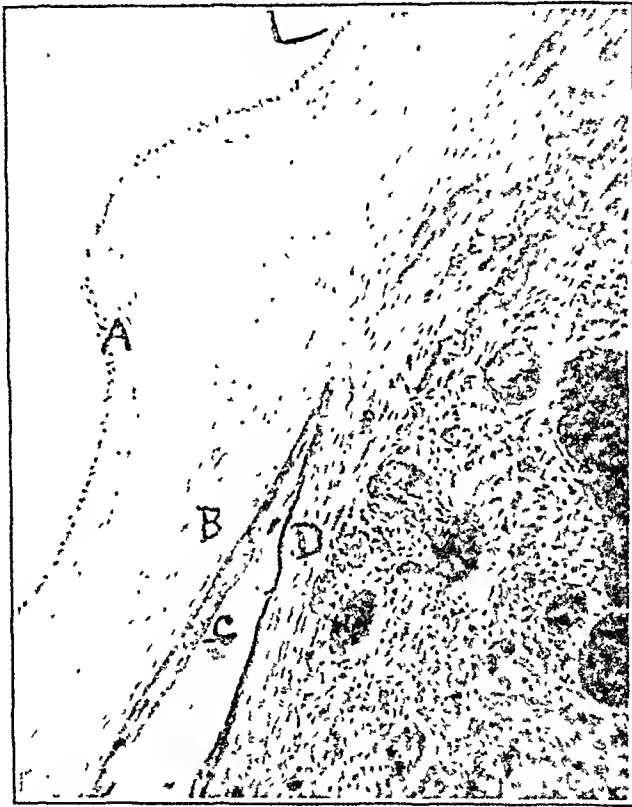


Fig. 4.—Junction of connective tissue and epithelium of the tumor with the chorion and amnion. A, Amniotic epithelium; B, chorionic connective tissue; C, chorionic epithelium; D, tumor.

For about three quarters of its circumference the tumor is invested by epithelium of the syncytial type which in some parts is composed of only a single row of nuclei and in others is many times this thick (Fig. 3). In general it seems well preserved except that in several places degeneration and even necrosis have taken place. Just within the epithelial covering there is a narrow but definite zone of dense connective tissue with long spindle-shaped nuclei (Fig. 4). Toward the amniotic surface, where the epithelial covering is absent, this connective tissue joins with that of the amnion in the same way as the chorion in the normal picture (Fig. 4). The large vessels from the cord which traverse the tumor beneath the amnion are invested by this tissue.

More than one-half of the interior of the tumor has a very loose areolar structure which is made up of spider and star-shaped connective tissue cells (Fig. 5). The

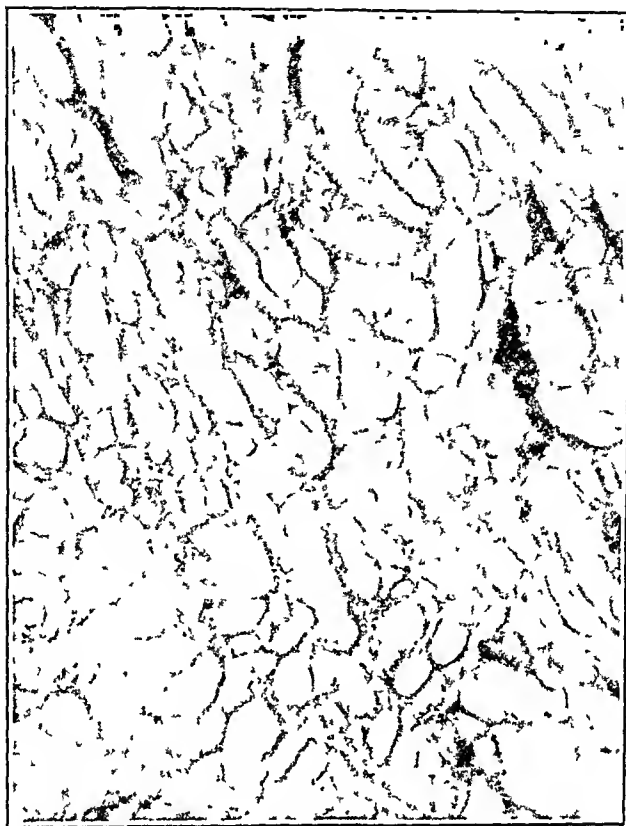


Fig. 5.—Tumor—areolar tissue with very large intercellular spaces.



Fig. 6.—Angiomatous part of the tumor.

intercellular spaces are empty in the stained sections and are irregular in size and shape, but tend to be large and round and are separated by very thin walls. Some blood-filled capillaries are found but are not numerous. In small, irregular patches the connective tissue is more dense and occasionally becomes quite cellular. This is more noticeable toward the side of the tumor near the maternal surface, and here about one-third of the mass, which is partially marked off by an invagination of epithelium on each side, gives a different picture (Fig. 6). The connective tissue stroma is quite dense and cellular, the cells being round or oval in shape. Small parts of this region give the appearance of a pure connective tissue tumor, but the larger portion shows many blood-filled capillaries dispersed or in groups, and the picture is that of typical angioma. The capillary walls are composed of only a single layer of endothelium.

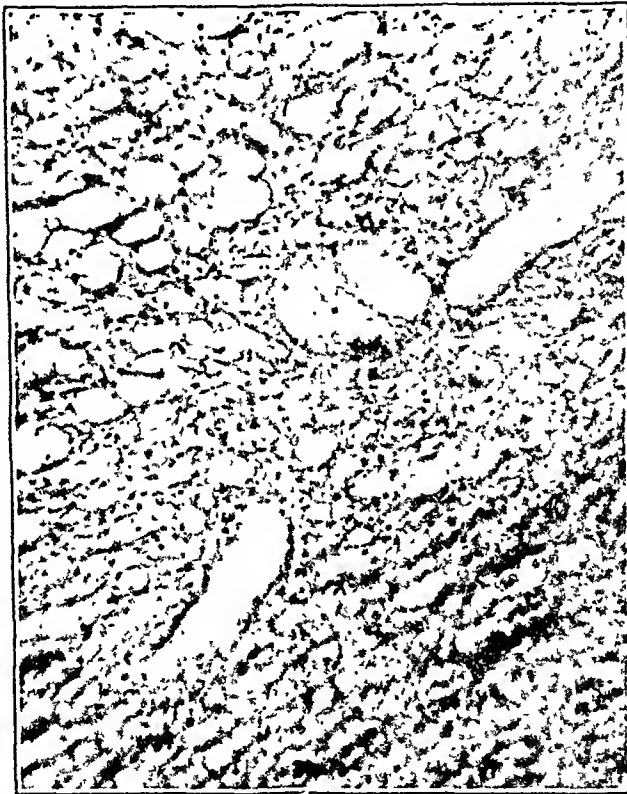


Fig. 7.—Section of tumor showing endothelial lined spaces about the size of capillaries but containing no blood.

To one side is a lighter staining lobule which is marked off from the rest of the tumor by a fairly definite border. This is largely made up of numerous round, oval, or oblong spaces separated from each other by narrow zones of connective tissue (Fig. 7). These structures are the size of capillaries and are lined by a single layer of endothelium. The great majority have no contents, but some are filled with a pink-staining homogeneous substance, and an occasional one contains blood. Apparently we are dealing with a development of capillaries which for some reason have not become filled with blood. Small parts of this region are in various stages of necrosis and hyaline degeneration with occasionally small areas of calcification.

The placental tissue outside of the tumor shows normal villi except for the region adjacent to the tumor. Here the villi directly next to the epithelial investment have in most places undergone hyaline degeneration similar to white infarction

so as to form a thin but not complete pseudocapsule. (Fig. 3.) At points on the periphery where this structure is incomplete, normal villi lie against the tumor, and show no evidence of compression. Sometimes the epithelium of a villus seems to fuse with that of the tumor, but nowhere is there a direct union between normal villi and the tumor. The umbilical cord shows no abnormality.

Diagnosis.—Chorioangiofibroma with fibrous tissue predominating but with areas showing the typical angioma structure. Placental villi and umbilical cord normal.

GENERAL DESCRIPTION

This growth belongs to a definite type of tumor of the placental villus and has a distinct structure. Although usually only one tumor is present in the placenta, Dienst and Ravano have each described as many as four, Steinbuchel six, while Von Mars found one large and many small masses. The size of the tumors is variable, ranging from that of a millet seed, pea or cherry to a weight of 400 grams (Trillat), size of child's head (Loebl-Rokitansky), 740 grams (Pulvirenti), and 780 grams (Dupin et Chabaud). The great majority have been found as firm elevations beneath the amniotic surface of the placenta. They are often crossed over by large vessels, and apparently bear no constant relationship to the point of insertion of the cord or the placental margin. However, they have been found on the maternal surface of the placenta and as succenturiate lobes (Goodhart, Calderini). They are characteristically well defined and sharply marked off from the remainder of the chorionic tissue, and as a rule are easily enucleable, frequently having a pseudocapsule, which upon microscopic examination is found to be composed of compressed and degenerated villi. In nearly one-half of the cases described, the only direct connection with the placenta consists of vessels entering at a single hilus, or by a small vascular pedicle. No particular search for such a structure was made in our tumor as it was preserved for a museum specimen. Some authors (Von Mars and Niebergall) describe a passage over and transition of normal villi into the tumor tissue, but Kramer, Bode and Schmorl, Albert, Beneke, Finzi, Kermauner, Köhler, and others have searched in vain for such a structure. Dienst believed that in the specimens of Von Mars and Niebergall serial sections would have shown that there was no actual transition of tissue but only a close approximation as was evident in one of his tumors. Von Mars saw only one "villus" thus entering the tumor which fact suggests that it was really a pedicle. Usually the tumor when shelled out is found to be a round or oval structure, but occasionally it is made up of a few or many lobes which are more or less pedunculated and faceted. Dienst held that the first type is the result of uniform and expansive growth, while the latter, he believed, showed a tendency to development of the tumor in the form of processes.

Upon cross section the surface usually gives a mottled appearance due to small darker areas separated by lighter colored septa which extend inward from a peripheral zone of fibrous tissue and carry large blood vessels. This picture is not so pronounced in tumors, or parts of tumors, where vessels are not abundant and the predominant tissue is fibrous or myxomatous. On microscopic examination, the mass is seen to be composed of fibrous (often myxomatous) tissue, in which there lie small capillaries which may be arranged in nests or diffusely scattered through the tissues. They show different degrees of dilatation or may be collapsed, and their walls may be composed of single-layered or proliferating endothelium. The relative proportions of fibrous or myxomatous tissue, and vessels, may vary markedly in different tumors or in different parts of the same tumor. Degeneration and necrosis of both types of tissue have been described frequently, especially in the interior of larger tumors. Calcification and hemorrhage or blood extravasation into the tissues have likewise been occasionally mentioned. In Yamato's specimen there was hydropic degeneration with cyst formation, while Labhardt describes a case of hemorrhagic infiltration which he thought was the result of bending of the pedicle and constriction of its vessels. The presence of smooth muscle fibers as mentioned by Santi, Pulvirenti, and Hojnaeki has not been confirmed by other observers.

In about one-third of the specimens there was a complete, in others a more or less perfect, epithelial investment, made up of syneytium or of Langhans cells, or elements of both. This has been found in a single layer, or heaped up and showing evidence of active proliferation. Maxwell and Valeri alone deny the presence of such a covering in their specimens.

The villi of the adjacent placental tissue have occasionally been found normal; but more frequently, and especially in the case of the larger tumors, they have degenerated under pressure. Usually there is a layer of compressed villi and fibrin next to the tumor, thus giving rise to a sort of pseudocapsule which resembles the ordinary white infarct in structure. Between this and normal placental tissue there may be a region in which the villi, with distended and tortuous vessels, are plastered together by fibrin. More will be said of this condition when origin and etiology are considered.

NOMENCLATURE

Different designations have been employed for these tumors, which are thus described and which undoubtedly belong to a single group. John Clarke did not attempt to name his tumor, but Danyau, in 1844, used the term organized blood clots, but says, "*D'ailleurs ces tumeurs different tout à fait des caillots ordinaires et des transformations*

habituelles qu'ils subissent." Goodhart, in 1877, was undecided between the terms "organized blood-clot" or "fibromyxoma," while Virchow, in 1863, disregarding the numerous large and small vessels, called his tumor "myxoma fibrosum placentae," which term was used for years, especially by German authors. The name "fibroma" was proposed by Kramer, Bode and Schmorl, and others. Hyrtl, in 1870, reported his cases under the title of "Placenta in Placenta" which he explains as meaning sarcoma of the placenta. Galabin used the name "fibrosarcoma." The presence of very cellular connective tissue in some of these tumors has led other writers to call them sarcomata (Nebesky), though there has never been any evidence of malignancy in the true sense (Albert). Dr. J. Whitridge Williams kindly made a statement as follows in regard to the tumor, diagnosed by him as sarcoma, which was reported by W. H. Cary in 1914: "I remember perfectly the tumor referred to by Dr. Cary. I saw it a number of years ago and Dr. Welch agreed with the diagnosis. With further experience, however, I feel that I made a mistake and that the tumor in question was a chorioangioma, with more connective tissue than blood vessel proliferation." Guéniot called his tumor "hypergenèse des éléments normaux," and Merttens considered his to be a simple hyperplasia of the villi. The most frequently employed terms, especially by the more recent writers, are "angioma of the placenta" and "chorioangioma." Auvard, Eras, and others called their tumors by the name "angiofibrome" of the placenta or chorion. Dienst suggested the name "angioma capilare myxofibrosum chorii" as indicating the types of tissues involved. This being too long, he proposed the term "Chorioma" combined with the qualifying name "angiomatosum" or "fibrosum" depending upon the predominating type of tissue. It would seem that the term "chorio-angio-fibroma" might be employed as covering all possibilities.

INTRODUCTION TO TABLE I

In Table I is given the statistical data of the 130 tumors (with ours 131), which were found in the literature and which could be definitely identified as belonging to this group. The careful consideration of descriptions of several which have been included in the tabulation of other writers has led to their omission here as not genuine or at least very questionable. On the other hand the addition of heretofore overlooked cases and those recently described makes this the largest number yet catalogued. In the case of nine the original reports could not be obtained, but the references which are indicated supplied sufficient data for verification of their character.

The most important tumors which have been included in other

studies of this subject, but which for various reasons are omitted from the tabulation, are given below:

Margeson described a mass 10x6x3 cm. which was free from the placenta except for a vascular pedicle, and which was believed to have prevented entrance of the head into the pelvis, necessitating delivery by cesarean section. The mass was possibly a tumor of this class, but there was no microscopic examination, and the gross description was not in sufficient detail for positive identification. Commandeur-Lacassagne reported a so-called angiomatous tumor which was expelled before the birth of a four months' fetus and placenta,—there was no pedicle or place of attachment on the placenta. The tumor described by Harper in 1852 (questioned by Kraus) has since been erroneously included in practically every tabulation. He says—"the outside felt firm and appeared to be fibrous, and upon cutting into it, I found it to contain a quantity of earthy matter, in appearance like dry mortar"—certainly not the picture of chorioangiofibroma. The article by Jeannin on tumors of the placenta presented no new tumor. Walz' tumors of the placenta were metastases from a sarcoma of the fascic lata. Eberth's "myxoma diffusum" was a generalized myxomatous proliferation between the amnion and chorion. Cornil found an apparently vascular mass in the uterus one year following delivery. Bender called it a placental polyp. Russel's and Oni's cases were also placental polyps. Child deals with a deciduoma malignum removed from the uterus four months after a five months' abortion. The reports of Fenomenow (questioned by Kraus) and Mark concern anomalies which are almost certainly distinct from chorioangiofibroma,—probably cysts of the chorionic trophoblast of the Ehrendorfer and Vassmer type, and are to be distinguished from the degenerative softening within a solid tumor as described by Yamato. Jotten, in addition to an authentic case of chorioangiofibroma, described a nodule found in the placenta of a patient dying in convulsions which he thought was a partially organized blood clot (possibly a red infarct or hematoma undergoing the alterations recently re-described by McNalley and Dieckmann). Schindler reported, besides a genuine chorioangiofibroma, a poorly defined nodule of closely packed angiectatic villi which he thought to be a transition between normal villi and tumor. A very similar structure described by Kraus is also omitted although accepted by him as possibly an early form. Solowij found the same picture throughout the larger part of a placenta, the other part of which was fibrotic. Müller found three such cases and also quotes von Franque's description of another. After a thorough study of the subject, which will be again referred to, he believed this "angiectasis of villi" to be a sequel of inflammation and not related to chorioangiofibroma, an example of which he also reported. The original articles of a few authors which possibly are concerned with placental tumors could not be obtained, nor did references contain sufficient data to determine their nature. Their names are given in the bibliography under a separate heading.

OCCURRENCE

Thus a careful search of the literature of the one hundred twenty-five years since Clarke has yielded only 130 descriptions of authentic tumors of this type which, with the one described in this paper, gives a total of 131. They have been found in nearly all parts of Europe, in America, and two are reported in the Japanese literature. It is interesting that the condition is not confined to man, Sparapani having given an excellent description of such a tumor in the placenta

TABLE I

	DATE	NAME OF AUTHOR	AGE	PARA	PREGNANCY	LABOR	CHILD	NO. TUM.	POSITION	SIZE TUMOR	SIZE PLACENTA	FORM OF GROWTH	PEDICLE OR HILUS	CAP-SULE	EPI-THEL. COVER-ING
1	1798	Clarke	*	*	Hydramnios 2 gallons (Winchester)*	Spontaneous	Normal	1	Fetal face	4x3x3 inches	7 ounces	Simple	Yes	Yes	*
2	1844	Loeb-Rokitansky (quoted by Breus)	*	*	*	*	*	1	Fetal face near cord	child's head	*	Simple	*	*	*
3	1844	Danyau	24	iii	Hydramnios Edema Large quantity amniotic fluid.	Manual removal plac.	7 months died first day	2	Fetal face near margin	8x11 cm.	20x24 cm. Large size	Simple	Yes	Yes	*
4	1844	Danyau	39	iii	Edema Large quantity amniotic fluid.	Spontaneous	3250 gm. macerated	1	Fetal face at margin	13x8.5x6 cm.	13x22x2.7 cm.	Simple	Yes	None	*
5	1863	Virchow	*	*	*	Hemorrhage	7 months alive	1	Maternal surface	Fist	*	Complex	*	*	*
6	1868	Hilderbrandt	20	i	Hydramnios	Spontaneous	8½ months 2200 gm. Died after 24 hrs.	1	Fetal face	Fist	1 pound	Complex	Yes	*	Yes
7	1870	Hyt1	34	i	*	Breech Extraction	Term still-born	2	*	1. cherry 2. walnut	*	Simple	Yes	Yes	*
8	1870	Hyt1	*	*	*	*	Term macerated	1	*	Fist	*	Simple	Yes	*	*
9	1870	Hyt1	*	*	*	*	Term	1	*	9x4.5 cm. Pigeon egg	*	*	*	*	*
10	1877	Goodhart	*	i	Normal	Spontaneous	Term Dead	1	Separate from placenta	6x4 cm.	*	Simple	*	*	*

11	1878	Storch	37	viii	No compli- cation	Spontaneous	Term, small, weak, died in few hrs. Term	1	Fetal sur- face be- tween cord and margin Near cord insertion	1.5x6 cm.	1140 gm. 26x20 cm.	Complex	Yes	Yes
12	1878	Storch	*	*	*	♀ (Spontaneous)	Term, died in few hrs. Term	1	Near cord insertion	3 cm. in diameter	Usual size	Simple	*	Yes
13	1878	Storch	*	*	*	♀ (Spontaneous)	Term, living	1	Imbedded in pla- centa	2.5 cm. in diameter	*	Complex	*	*
14	1879	Hogden	30	iv	*	Tumor ex- pelled be- fore pla- centa	Term, living	1	On fetal surface	1x3 inches	*	Simple	*	*
15	1880	Breus	19	i	Normal	Spontaneous	7 months 1100 gm. Died in few min- utes	sev- eral	Maternal surface	Largest 7 cm. diam- eter 90 grams	*	Simple	Yes	*
16	1880	Breus	22	ii	Normal	Spontaneous	Term 2800 gm.	1	Fetal sur- face near cord	Goose egg	17 cm. diameter	Simple	*	*
17	1880	Breus	*	*	Normal	Spontaneous	Twins (identical) 8 months living	1	*	*	*	*	*	*
18	1882	Nicolini	33	ix	Hydram- nios Edema legs	Spontaneous (induced by rup- ture mem- branes)	1860 gm. Recently dead	1	Fetal sur- face near cord	25x9x5.5 cm. size of orange	1055 gm.	Simple	*	*
19	1882 1885	Galabin	*	*	*	*	*	sev- eral	Fetal sur- face	1. Human heart	*	Simple	*	*

TABLE I—CONT'D

	DATE	NAME OF AUTHOR	AGE	PARA	PREGNANCY	LABOR	CHILD	NO. TUM.	POSITION	SIZE TUMOR	SIZE PLACENTA	FORM OF GROWTH	PEDICLE OR HILUS	CAP-SULE	EPI-THEL. COVER-ING
20	1887	Auvard	21	i	Eclampsia	Accouchement forcé	Term 2910 gm. Dead	1	In substance of placenta	Walnut	*	Simple	Yes	*	*
21	1888	Guéniot	*	i	*	Spontaneous	Dead 7 months weak, living *	1	Fetal surface next to cord	Mandarin	Usual size	Simple	*	*	Yes
22	1889	Dupin et Chabaud	25	i	*	Tumor removed manually	Twins 7 months 36 and 38 cm. Died after 2 hr. *	1	*	780 gm. 7×22 cm.	*	Complex	Yes	*	*
23	1890	Kramer	25	iii	Hydramnios Albuminuria Cyindruvia *	Spontaneous	Twins 7 months 36 and 38 cm. Died after 2 hr. *	2	Fetal surface of 2nd placenta	1. 9×8×3 cm. 2. 5×3×2 cm.	*	Simple	*	None	*
24	1891	Acker-mann	*	*	*	*	Term, 2950 gm. living	1	*	Small cherry 1. Hen's egg 2. Walnut	*	*	*	*	*
25	1891	Alin	29	iii	Normal	Normal	Term, 2950 gm. living	2	Fetal surface at margin	15×15×1.5 cm.	15×15×1.5 cm.	Complex	Yes	None	Yes
26	1891	Alin Ref. Albert, Dienst, etc.	28	i	Normal	Spontaneous	Term, 3000 gm. living	1	Margin fetal surface	Walnut	680 gms.	*	*	*	Yes
27	1891	Alin Ref. samo	*	*	*	Spontaneous	Term, Living	2	Maternal surface	1. Walnut 2. Bean	*	*	*	Yes	Yes
28	1891	Alin Ref. same	24	iii	*	Normal	Living	1	Fetal surface eccentric	Hen's egg	*	*	Yes	*	*

29	1892	Lazarewitsch	17	i	*	Manual removal placenta	Manual re-4000 gm. Living Term	1	Maternal surface	Small child's head	*	*	Yes	*
30	1892	V. Steinbuchel	37	vii	Syphilis?	Hemorrhage Manual removal placenta Normal	Term	1	Fetal surface face	12.5x9.5 cm.	27 cm. diameter	Simple	Yes	*
31	1892	V. Steinbuchel	40	vi	Hydramnios Edema No albuminuria	Normal	Twins— 1. Living 1226 gm 2. Hydrocephalus died in ½ hr. generalized edema	6	Near insertion of cord No. 2 deep in placenta	From size of large nut to orange	1620 gm. 32x25.5 cm.	Simple	Yes	*
32	1895	Bode and Schmorl	26	iii	Vomiting	Hemorrhage curetage tamponade *	Premature macerated	1	Fetal surface on margin	Fist	*	Simple	Yes	Partial
33	1895	Leopold	*	*	*	Normal	Term	1	*	*	*	*	*	*
34	1895	Mertens	*	*	Normal	Normal	Dead, Edema, Stenosis aorta	1	Fetal surface on margin	12x8 cm.	10x17 cm.	Complex	Yes	Yes
35	1896	V. Mars	24	i	Hydramnios No. 2 (10 litres) urine negative	Normal	Twins— 7½ months No. 1 living 1500 gm. No. 2 macerated	many	On fetal surface or deep in substance of the single placenta	Millet seed to walnut	*	Simple	Yes	Yes

TABLE I—CONT'D

	DATE	NAME OF AUTHOR	AGE	PARA	PREGNANCY	LABOR	CHILD	NO. TUM.	POSITION	SIZE TUMOR	SIZE PLACENTA	FORM OF GROWTH	PEDICLE OR HILUS	CAP-SULE	EPI-THEL. COVERING
36	1897	Niebergall	29	i	Normal	Spontaneous	Term, 2500 gm. living	3	Fetal sur-face next to cord	1. 6x6x7cm. 2. Hazel-nut 3. Smaller	1100 gm.	Complex	?	None	Yes
37	1897	Orloff Ref. Albert	18	i	Albuminuria Marked hydramnios	Spontaneous	Term Excellent 3380 gm.	1	Fetal sur-face 5-6 cm. from cord	Goose egg	690 gm.	Simple	Yes	*	*
38	1897	Orloff Ref. Albert	29	i	Syphilis? Greatly increased amniotic fluid *	Spontaneous	6 months 1220 gm. Died 2nd day	1	At margin	Walnut	*	Simple	*	*	*
39	1898	Albert	38	i		Premature rupture membranes	Weak	1	Separate from placenta	5x5x2.6 cm.	490 gm.	Simple	Yes	*	Yes
40	1898	Albert	29	iii	*	Spontaneous Hemorrhage	*	1	Opposite cord on margin	9x11x5.5 cm.	790 gm.	Simple	Yes	*	Yes
41	1898	Loenberg	27	i	Hydramnios Endometritis.	Hemorrhage	35 cm. long Died soon	1	Maternal surface	8x5.6x4.2 cm.	610 gm.	Complex	Yes	Yes	Partial
42	1899	Van der Feltz	41	viii	Normal	Spontaneous	Term	1	Fetal sur-face near cord	Mandarin	*	Complex (2 lobes)	Yes	Yes	Yes
43	1899	Van der Feltz	26	i	Normal	Podalic version	Excellent	1	Fetal sur-face near cord	Pigeon egg	*	Simple	?	Yes	*

44	1899	Osterloh	18	i	*	Spontaneous	*	1	Margin	Small apple	*	Simple	*	Yes	*
45	1899	Beneke	28	ii	Normal Very abundant amniotic fluid.	Spontaneous	Term, 2650 gm.	1	Fetal sur- face near margin	7.5x6x5 cm.	Yes	Simple	Yes	Yes	*
46	1900	Eras	*	i	*	Placenta expressed by Credé maneuver	Normal	1	Fetal sur- face at margin	Apple	*	*	*	*	*
47	1900	Lehmann	37	vii	No hy- dramnios	Spontaneous	*	1	*	Apple	*	*	Yes	Yes	*
48	1903	Dienst	44	xvii	Hydram- nios Hyper- tension	Spontaneous	Asphyxia- Well af- ter 3 days	1	2 cm. from cord	10x8x5 cm.	Yes	Simple	Yes	Yes	Yes
49	1901	Oberdor- fer	35	iii	No hy- dramnios	Podalic version	Term, 3330 gm. Died in 3 1/4 hour	1	Fetal sur- face near cord	7.4x5.8x3.7 cm. Size goose egg	Yes	*	*	*	*
50	1901	Bretschnei- der	32	*	*	Spontaneous	Living	1	Fetal sur- face near cord	Apple	*	Simple	Yes	Yes	*
51	1901	Hojnacki	*	*	Normal	Normal	Term	5	Fetal sur- face	1. Four size of walnut 2. One size of apple	*	Simple	Yes	Yes	*
52	1901	Lewino- witsch Ref. Jot- ten	*	*	*	*	*	1	*	*	*	*	*	*	*
53	1902	Hochl	*	*	*	*	*	1	Margin	Pigeon egg	*	Complex	*	*	*

TABLE I—CONT'D

	DATE	NAME OF AUTHOR	AGE	PARA	PREGNANCY	LABOR	CHILD	NO. TUM.	POSITION	SIZE TUMOR	SIZE PLACENTA	FORM OF GROWTH	PEDICLE OR HILUS	CAP- SULE	EPI- THEL. COVER- ING
54	1902	Calderini	36	ix	Hyam- nios	Hemor- rhage Manual removal placenta	7 months not resus- citated	1	In mem- branes separate from pla- centa	335 gm.	790 gm.	?	Yes	*	*
55	1903	Dienst	25	ii	Mitral in- sufficiency albu- minuria Cylind- ruria Excessive amniotic fluid *	Hemor- rhage 1800 c.c.	1240 gm. died 1st day. For- men widely open	4	Fetal sur- face and in pla- cental tis- sue	1. 11x10x7 cm. 2. Apple 3. Walnut 4. 1.8x1.3x 0.35	1700 gm.	Simple	Yes	Yes	Yes
56	1903	Kraus	*	*	*	*	*	1	Fetal sur- face next to cord	Small apple	*	Simple	?	None	Par- tial
57	1903	Kraus	*	*	*	*	*	1	Fetal sur- face next to cord Also on maternal surface	5. Kronen piece	*	Complex	Yes	None	Yes
58	1903	Kraus	17	i	Moderate albu- minuria Eclampsia Marked Albumin- uria	Spontane- ous	2750 gm. normal	sev- eral	Near margin	1. Lentil others smaller 1.5 cm. Kronen piece	*	Complex	*	*	Yes
59	1903	Kraus	25	i	Eclampsia Marked Albumin- uria	Accouch- ment Forcé Hemor- rhage	2300 gm. Died in few min- utes Autopsy negative	1	Fetal sur- face near margin		*	Complex	Yes	*	Yes

60	1903	Kraus	33	i	Marked albu- minuria	Breech ex- traction Prolapsed cord	Stillborn Prena- ture	3	In pla- cental tis- sue	All size hazelnut	*	Simple	*	Yes	Yes
61	1903	Böhne	?	i	Normal Rather abundant amniotic fluid	Spontane- ous	2050 gm. Excellent	1	Fetal sur- face	Man's fist	1040 gm. 22x21x23 cm.	Simple	*	*	*
62	1904	Labhardt	42	viii	Normal	History suggest- ing pre- mature separa- tion of placenta	Dead .45 cm. long	1	Maternal surface near mar- gin	Nut	.480 gm.	Simple	Yes	*	*
63	1904	Finzi	43	*	Hydram- nios 6 liters	Spontane- ous	3200 gm. Excellent	1	Fetal sur- face near cord	10x10x6.5 cm.	970 gm.	Simple	?	None	Yes
64	1904	Ries	?	Mul- tipara iii	Normal	Spontane- ous	*	1	Fetal sur- face	*	*	?	*	*	Yes
65	1904	Dienst	32		Hydram- nios 4 to 5 liters	Spontane- ous	Excellent	1	Fetal sur- face	Apple	*	*	*	*	Yes
66	1904	Santi	24	v	Normal	Spontane- ous	4000 gm. Excellent	1	Fetal sur- face	Egg 4x6 cm.	890 gm. 21x25 cm.	Simple	*	Yes	Yes
67	1904	Gheorghiu	23	i	Normal	Spontane- ous	2900 gm. Excellent	1	Substance of pla- centa	5 cm. di- ameter	550 gm.	?	*	*	*
68	1905	Butter- mann	*	*	*	*	*	2	Fetal sur- face	Apple	*	*	*	*	*

TABLE I—Cont'd

DATE	NAME OF AUTHOR	AGE	PARA	PREGNANCY	LABOR	CHILD	NO. TUM.	POSITION	SIZE TUMOR	SIZE PLACENTA	FORM OF GROWTH	PEDICLE OR HILUS	CAP-SULE	EPI-THEL. COVER-ING
69	Ferroni	34	viii	Hydramnios 2nd twin	Podalic version of both for shoulder presentation	Single ovum twins at 8 mos. No. 2 died in first week	1	Fetal sur-face of No. 2 next to cord	9x7x5.5 cm. Hen's egg	570 gm.	Complex	*	None	Yes
70	Colin	25	iv	Hydramnios 4 liters	Spontaneous	2800 gm. Excellent	1	Fetal sur-face	Mandarin	*	Simple	Yes	Yes	None
71	Viana	30	*	Normal	Spontaneous	3350 gm.	1	Both sur-faces near mar-gin	4.2x2.8 cm.	600 gm.	*	*	Yes	*
72	Eggel	*	*	*	*	Club feet and hands (Pres-sure)	1	On pla-centa	Size kid-ney	*	*	*	*	*
73	Schickele	*	*	Albu-minuria	*	*	1	Placenta substance	Pfennig	*	Complex	*	None	Yes
74	Pitha	*	*	*	Premature	*	several	Placenta substance	*	*	Complex	Yes	*	Yes
75	Pitha	*	*	*	*	*	1	Fetal sur-face near cord and margin	Hen's egg	*	*	Yes	*	Yes
76	Pitha	*	*	*	*	*	1	Near mar-gin	Walnut	*	*	*	*	Yes
77	Marschak	31	ii	No palpitation. No edema.	Spontaneous	*	1	Fetal sur-face	14x10x4 cm.	20x21 cm.	*	*	Yes	*

78	1907	Kernauner	19	i	Normal	Spontaneous	Term living 1440 gm. Died after 6 days	1	Placental substance face near cord	Hazelnut 9x7x3 cm.	*	Complex	Yes	*	Yes
79	1907	Schindler	20	i	Considerable amniotic fluid.	Spontaneous	3720 gm. Living 46 cm.	1	Fetal face near cord	730 gm. 18x19 cm.		Simple	*	*	Yes
80	1907	Müller	21	i	Normal	Spontaneous	2220 gm. Living 46 cm.	1	In placental substance	Size of a cotyledon	Expected size	Complex	Yes	*	Yes
81	1907	Müller	*	*	Normal	Spontaneous	long Term, healthy	1	Fetal face	*	*	*	*	*	*
82	1908	Schindler	42	ii	Normal	Spontaneous	3720 gm. Died 2nd day. Patient foramen ovale, etc.	1	Fetal face near margin	3.5x2.5x1.5 cm.	770 gm. 18x20 cm.	?	*	*	Yes
83	1908	Brindeau et Nat-tan-Larrier	*	ii	Hydramnios	*	3650 gm. Normal	1	Fetal face near margin	Small hen's egg	560 gm.	Simple	Yes	*	*
84	1908	Brindeau et Nat-tan-Larrier	*	i	Normal	*	3200 gm.	1	Fetal face near cord	Pigeon egg	475 gm.	Simple	Yes	*	*
85	1908	Brindeau et Nat-tan-Larrier	*	i	Normal	*	3150 gm.	1	Fetal face at cord	Dried fig	450 gm.	Simple	Yes	*	*
86	1908	Brindeau et Nat-tan-Larrier	*	Multipara	Marked hydramnios	Spontaneous	3600 gm.	1	Fetal face near cord	Fist	750 gm.	Simple	?	Yes	*

TABLE I—CONT'D

	DATE	NAME OF AUTHOR	AGE	PARA	PREGNANCY	LABOR	CHILD	NO. TUM.	POSITION	SIZE TUMOR	SIZE PLACENTA	FORM OF GROWTH	PEDICLE OR HILUS	CAP-SULE	EPI-THEL. COVER-ING
87	1908	Ravano	18	*	Hydram-nios (5 liters)	Spontane-ous	770 gm. died, no lues	3	Maternal surface	1.75 gm. 7x6.8x4.5 cm. 2. size of hazelnut	450 gm.	Complex	Yes	None	Par-tial
88	1908	Grafen-berg	*	*	Hydram-nios	Podalic version Trans-verse presenta-tion	7 months Dead (recent-ly)	1	?	Human kidney	large	Simple	None	*	Yes
89	1908	Funck-Bretano et Dur-ante	25	ii	Hydram-nios slight al-buminuria	Induction by bal-loon	1310 gm. Died 1st day. Autopsy negative	1	Fetal sur-face at cord	8x5 cm. Human kidney	800 gm.	?	*	*	*
90	1909	Anderodias	36	ii	Increased amniotic fluid	1. Podalic version for trans-verse presenta-tion 2. Hemor-rhage manual removal placenta	Weak, died in 24 hr.	1	Fetal sur-face 7 cm. from cord	10x6x5 cm. Turkey egg	680 gm.	Simple	Yes	*	*
91	1909	Schlenzka	*	*	Normal	Acute hy-dramnios	Living	1	Fetal sur-face near cord and margin	10x6x4.5 cm.	16x15x2 cm.	Simple	Yes	*	*

92	1909	Kaufmann	*	*	*	*	1	Chorion surface	Cherry	*	Simple	Yes	*	*
93	1909	Kaufmann	*	*	*	*	1	Chorion surface	Apple	*	Simple	Yes	*	*
94	1909	Kaufmann	*	*	*	*	1	Chorion surface	Hen's egg	*	Simple	Yes	*	*
95	1909	Eike	21	i	Normal	Spontaneous Intrapartum bleeding	3900 gm. Stillborn	Fetal surface at cord on margin	5x6x9 cm.	580 gm.	Simple	Yes	*	Yes
96	1909	Lange	*	*	Acute hy-dramnios	Normal	Normal	Fetal surface near cord and margin	Kidney	*	Simple	?	*	Yes
97	1909	Pulvirenti	34	iv	Hydramnios	Spontaneous	Term Asphyxiated	Fetal surface	Child's head, 7.40 gm. 17.5x14.5 cm.	712 gm.	Simple	Yes	*	*
98	1910	Theuveny	27	*	Normal	Normal	2870 gm. Living	Fetal surface 3 cm. from cord	Small egg of hen 80 gm.	650 gm.	Complex	Yes	*	*
99	1910	Thaler	*	*	Normal	Spontaneous	*	*	Large	*	*	*	*	*
100	1910	Thaler	*	*	Normal	Spontaneous	*	*	Large	*	*	*	*	*
101	1910	Schottlander	*	*	*	*	Term	Fetal surface near margin	Small	Term	*	*	*	*
102	1911	Maxwell	32	vi	*	1. Placenta previa 2. Transverso Presentation	Stillborn	Fetal surface	*	*	Simple	Yes	Yes?	None

TABLE I—CONT'D

DATE	NAME OF AUTHOR	AGE	PARA	PREGNANCY	LABOR	CHILD	NO. TUM.	POSITION	SIZE TUMOR	SIZE PLACENTA	FORM OF GROWTH	PEDICLE OR HILUS	CAP-SULE	EPI-THEL. COVER-ING
1911	Bertolini	39	viii	Hydramnios 10 liters. Slight albuminuria	Spontaneous	2200 gm. Died 12th day Sclerema neonatorum	1	Maternal surface	7 cm diameter	1100 gm.	Simple	Yes	Partial	Yes
1911	Brenneke	*	*	Normal	Normal	Normal	1	Fetal surface near margin	Half size hen's egg	*	?	*	*	*
1910	Hauser	24	i	Normal	Spontaneous	1750 gm. Living	1	Fetal surface near margin	Walnut	120 gm. 14x11x2 cm.	Simple	Yes	Yes	*
1911	Hauser	24	ii	Normal	Spontaneous	Died on 26th day of syphilitic penphigus	1	Maternal surface	7.5x3x2.5 cm.	Normal	Simple	Yes	?	*
1911	Kummer	42	xii	Headache	Spontaneous	7 to 8 lb. normal	1	Fetal surface at cord	3x7x5 cm.	*	*	*	Partial	*
1912	Ito Ref. Yamamoto	*	*	*	*	*	3	*	1. 3.5x3 2. 3x2 3. 3x2.5	*	*	*	Yes	*
1912	Ogato Ref. Yamamoto	40	*	Normal	Spontaneous	Living	1	Fetal surface	Hen's egg	*	Simple	None	*	*
1912	Johnstone	25	ii	Hydramnios	Spontaneous	Premature Died after 24 hours	1	Maternal surface	3x4.5 inches	*	Complex	Yes	*	Yes

111	1912	Plauehu	20	i	Hydramnios (3300 c.c.)	1. Induced by rupture of membranes 2. Manual removal of placenta	1560 gm. Alive at 20 days	1	Maternal surface	Orango	340 gm.	Simple	Yes	*	*
112	1912	Elten	*	*	Normal	Spontaneous	3650 gm. Excellent	2	1. On margin through placenta 2. Insertion of cord	1. Larger than fist 2. Apple	*	Complex	Yes	1. Yes 2. None	Partial
113	1912	Elten	*	*	No hydramnios	Spontaneous	3250 gm. Excellent	1	Under insertion of cord	10.5x9x4.5 cm.	1890 gm.	*	?	*	*
114	1913	Jotten	*	Multi-para	Normal	Spontaneous	Living	2	1. at margin 2. at margin	1. 7x8.2x9.7 cm. 2. 3.5x2.5x4 cm.	23.5x17x1.5 cm.	Simple	Yes	None	*
115	1913	Fruhenscholz and Hocho	31	iv	Hydramnios 3 previous premature labors	Breech extraction Prolapsed cord	1700 gm. Died 5th day	1	At marginal section of cord	Orange	730 gm.	Simple	*	*	*
116	1913	LePage	*	ii	Hydramnios 5.5 liters Wassermann positive	Spontaneous	2650 gm. Died 3rd day	1	Maternal surface	10x11 cm.	625 gm. 19x21 cm.	Simple	Yes	Yes	*
117	1913	Yamato	27	iii	Normal	Spontaneous	2900 gm. Excellent	1	Fetal surface near margin	3x2x1.5 cm.	580 gm. 19x16x2.2 cm.	Simple	?	*	Yes

TABLE I—CONT'D

DATE	NAME OF AUTHOR	AGE	PARA	PREGNANCY	LABOR	CHILD	NO. TUM.	POSITION	SIZE TUMOR	SIZE PLACENTA	FORM OF GROWTH	PEDICLE OR HILUS	CAP-SULE	EPI-THEL. COVER-ING
118	1913	Engelhard	*	ix	*	Spontaneous Credé ex- pression of pla- centa	3500 gm.	1	Fetal sur- face at margin	9×6.5×3.5 cm.	16×16×2.5 cm.	Simple	*	*
119	1914	Nebesky	*	v	Normal Wasser- mann negative	Spontaneous	2580 gm.	1	Fetal sur- face be- tween cord and margin	6.5×7.5×4.5 cm.	880 gm.	Simple	*	Par- tial
120	1914	Cary and J. W. Williams	19	i	Normal	Spontaneous	6 lbs. 3 oz. Alive	1	Maternal surface	Child's fist	14×14 cm.	Complex	*	Yes
121	1915	Vateri	24	ii	Normal	Spontaneous fol- lowed by convul- sion, cyanosis, amblyopia	3100 gm.	2 ?	Maternal surface at margin	1. Orango 8×5 cm. 2. 15×5 cm.	1160 gm.	? 1. Yes 2. None	Yes	None
122	1915	Ribbert	*	*	*	*	*	1	Fetal sur- face near cord	9 cm. di- ameter	*	Simple	Yes	*
123	1918	Köhler	21	i	Normal	Spontaneous	2750 gm. Excellent	2	Maternal surface	1. 10×8 cm.	*	Simple	?	Par- tial
124	1919	Moller and Lohse	*	ii	Pyeloneph- ritis, Edema, cardiac disease, albumi- nuria	Manual re- moval placenta	2500 gm. Living	sev- eral 1	Maternal surface	2. 4×2 cm. +	820 gm.	Simple	*	*

125	1920	Trillat	22	i	Normal	Spontaneous	3030 gm.	1	Margin	12x11 cm. about 400 gm.	1130 gm.	Simple	Yes	*
126	1920	Roscher	32	ii	"Kidney disease"	Spontaneous Hemorrhage	Slightly asphyxiated	1	Fetal surface next to cord	150 gms. 7.5x3x4.5 cm.	1700 gm.	Simple	Yes	Yes
127	1921	J. T. Williams	22	i	Normal	Low forceps	Normal Term	2	1. Fetal surface at margin and next to cord 2. In placental tissue	1. 10.5x10 x6 cm. 2. 3.5 cm.	20x16x2 cm.	Simple	Yes	*
128	1921	Lacassagne et Vigne	33	i	*	Podalic version for transverse presentation	2700 gm. Stillborn	1	" "	Nut	310 gm.	Simple	*	Yes
129	1921	de Snoo	26	ii	Hydramnios marked	1. Spontaneous breech removal 2. Manual removal placenta	Cyanotic Died after 28 hrs. Abdomen distended	1	Fetal surface next to cord	11x13x9 cm.	18x19 cm.	?	?	*
130	1923	Strachan	*	*	*	*	*	1	Amniotic surface near margin	2.5x2.5 inches	*	Simple	*	*
131		Siddall	24	i	Normal	Spontaneous L.M. P. - rotated	Hemorrhagic disease Well	1	Fetal surface next to cord	10x7.5x4.5 cm.	25x20x2.5 cm.	Simple	?	Partial

expelled by a bitch after premature labor, the pregnancy having been complicated by hydramnios. He also mentions three similar cases in animals reported by others, including one in the cow (Morot). Nearly all of the tumors described for the human have been found at and reported from the larger clinics, and it has been suggested that many others are overlooked or not reported. Kraus obtained four (one of which is excluded from this series as not authentic) in less than a year at one obstetrical clinic in Vienna. But, Leopold found only one tumor in 7000 to 8000 placentae which he carefully examined. Brindeau and Nathan-Larrier in six years found four among the placentae from different hospitals of Paris. On the other hand, they believe that this apparent rarity is due to the fact that small tumors are not reported (also suggested by Storeh in 1878 and by Kraus), as they have frequently found nodules resembling the larger tumors in structure. They were apparently especially associated with albuminuria. Except for the relation to albuminuria, experience with the routine microscopic examination of placentas has confirmed the frequency of such findings. However, their identity with true chorio-angiofibroma has not yet been proved.

A statistical study of the data gathered from the case reports shows no relation between the frequency of occurrence and age, or parity. In 84 cases the parity of the mother was noted—primiparae 37, multiparae 47, about the usual ratio. Of the 78 patients in whom the age was mentioned, 52 were between twenty and thirty-five years, the usual childbearing age period; while 9 occurred in patients younger than twenty and 17 in those older than thirty-five. Multiple pregnancy was present 5 times in the series. In 92 cases, where the condition of the mother was mentioned, the presence of certain symptoms or signs of disease were noted as follows: nephritis or (so-called) toxemia 10 times; syphilis 4 times; cardiac disease and eclampsia twice; endometritis, hypertension, and pyelonephritis once each. These tumors are definitely associated with only one abnormality of pregnancy, namely, hydramnios, which in this series was present 32 times, while increased amniotic fluid was noted in 4 other cases. Thus hydramnios or increased amniotic fluid occurred in 32.7 per cent of the 110 cases where a note was made concerning pregnancy or labor, or in 27.5 per cent of the entire series. This relation will be discussed further.

(To be concluded in November)

PREGNANCY GLYCOSURIA WITH HYPERGLYCEMIA*

BY SAMUEL BERNARD SCHENCK, M.D., BROOKLYN, N. Y.

(Associate Gynecologist, Jewish Hospital, Instructor in Obstetrics and Gynecology,
Long Island College Hospital)

THE appearance of sugar in the urine during pregnancy has for a long time been considered a matter of great importance. When routine urinalysis in prenatal examination shows a reduction of Fehling's solution, in many cases further examination will show that the sugar is lactose and not glucose. Cron¹ in 2200 cases found a percentage of 3.5 with lactosuria. Williams² reports 5 per cent, while with more accurate chemical methods Commandeur and Porcher³ found a lactosuria in 80 per cent. In view of the frequency of lactosuria and its unimportance it is essential that it be ruled out. However, in a case of true glycosuria, it becomes necessary to determine the sugar content of the blood. Rowley⁴ reported from the Mayo Clinic that the normal range for blood-sugar concentration in normal pregnant women was from 0.09 to 0.11 per cent, the same as in the nonpregnant.

Glycosuria in pregnancy has been assumed to be due to one of several causes. The most serious is true diabetes mellitus. Alimentary glycosuria and renal glycosuria may occur, and also the condition described by Wallis and Bose⁵ as intermittent glycosuria. The latter conditions are all differentiated from diabetes mellitus by a normal blood sugar, in addition to other findings to be described later.

I have recently observed several cases that seem to be of a different type, and I have been unable to find any other similar cases described in the literature. These cases may be briefly described as presenting a glycosuria together with a hyperglycemia during pregnancy, both findings disappearing after delivery.

If a woman with diabetes mellitus becomes pregnant, a condition which fortunately does not occur so very frequently because sterility is common in diabetics (DeLee⁶) the condition is very serious and it may be necessary to induce abortion and premature labor in a grave case. Cron¹ states that the condition should be carefully watched and unless a carbohydrate equilibrium can be maintained, pregnancy should be terminated, the advantages of cesarean section under nitrous oxide and oxygen anesthesia being kept in mind. It is, however, occasionally safe, particularly in a case of diabetes of many years' standing, (Joslin⁷) to permit the pregnancy to go to term under careful observation of the urine and blood-sugar content and a rigid diet. With the addition of

*Read before the Brooklyn Gynecological Society, meeting of March 7, 1924.

insulin to the armamentarium of the physician in his fight against diabetes, it may prove feasible to induce labor less often and carry more of these patients to term. Raveno⁸ reports a recovery in a case of diabetic coma complicating pregnancy by the use of insulin.

Occasionally true diabetes mellitus may begin during pregnancy. Perez⁹ reports a case of typical diabetes mellitus developing in a previously healthy but obese woman in her second pregnancy. She was carried along by conservative treatment to term and was delivered of a large cyanotic baby which died in thirty minutes. Joslin gives a better prognosis for this type of case, a pregnant woman who develops diabetes, than in the type previously described, the diabetic patient who becomes pregnant. Bell¹⁰ reports two cases carried to term, both mothers and one of the babies surviving, and pleads against unnecessary induction of labor and sacrifice of the child.

Alimentary glycosuria is more apt to occur in the pregnant than the nonpregnant woman because she is more apt to commit dietary indiscretions, because there may be a temporarily lowered renal threshold (Lemann¹¹), or because of a decreased glycogen function of the liver (DeLee⁶).

Renal glycosuria, a glycosuria without hyperglycemia, has often been observed during pregnancy. By estimation of the blood sugar diabetes mellitus is ruled out. Most men believe that this condition is of no importance and is not dangerous (Wallis and Bose,⁵ Bell,¹⁰ Lemann¹¹). Joslin cites a case where glycosuria appeared during pregnancy in 1909 and appeared also in four subsequent pregnancies, disappearing in the interim, the highest blood-sugar concentration at any time being 0.11 per cent. He is, however, so skeptical of renal glycosuria save after years of observation that the patient is advised by him to lower the carbohydrate intake one-third, to restrict actual sugar, and to keep underweight.

In intermittent or transitory glycosuria, sugar appears in the urine at irregular intervals without any relation to diet (Wallis and Bose,⁵ R. L. Wallis¹²). Hyperglycemia is not present. Polyuria was often noted. Wallis and Bose ascribed this condition to excessive function of the pituitary gland and cite the glucose tolerance test which they found to substantiate their theory of this condition. They have noted symptoms of pituitary hyperactivity, such as increased intracranial pressure and a hyperexcitability of the sympathetic nervous system. When these cases were followed after delivery, it was noted that as in the cases described as renal glycosuria, this finding disappeared after the birth of the child and until the patient became pregnant again.

These cases of glycosuria without hyperglycemia in the pregnant woman, whether renal glycosuria or intermittent glycosuria, should not be dismissed, as many cases reported in the literature should make us realize that there is an element of danger in this type of case. DeLee

states that he believes this condition to be the first warning of true diabetes. Futeher¹³ writes that in rare instances diabetes appears to be induced by pregnancy, glycosuria first manifesting itself during the pregnant period. Joslin⁷ cites one case with glycosuria in 1897 during pregnancy which disappeared after delivery (of a dead child) and returned nine years later in the form of severe diabetes. Foster¹⁴ reports a case where glycosuria disappeared after two pregnancies but after the third became real diabetes with all the classical symptoms.

I have observed several cases which cannot be classed in any of the groups that have been described and I have been unable to find previous description in the literature of similar cases. These patients have had not only a glycosuria, but also a hyperglycemia, occurring during the pregnancy, and after delivery both the glycosuria and the hyperglycemia disappeared. They differ from renal glycosuria in that they present a hyperglycemia which is supposed to be the line of demarcation between renal glycosuria and diabetes mellitus, but they nevertheless have no symptoms, feel perfectly well, and after delivery lose their glycosuria and hyperglycemia.

CASE 1.—Mrs. P. S., thirty years old, seen for the first time on October 31, 1922, had never been ill. She had two children, ten and five years old, pregnancies and labors were normal. Physical examination showed a well-developed woman, a little obese, normal head, neck, heart and lungs. The fundus uteri was at the level of the umbilicus corresponding with the menstrual history, the last menstruation having occurred on May 17, 1922. The fetal heart sounds were normal. The pelvic examination showed the diagonal conjugate ample and a cervix with bilateral lacerations. The blood pressure was 110 systolic and 60 diastolic. Urinalysis negative. She came to the office for her next prenatal visit on November 28, 1922, feeling perfectly well. Urinalysis, however, showed a reduction of Fehling's solution. She was referred to an internist who found that the urine had 1 per cent glucose and that the blood-sugar concentration was 0.132 per cent, with the stomach empty. Her carbohydrate intake was restricted and I observed her closely during the remainder of her pregnancy. She felt well although the glycosuria persisted. On January 24, 1923, she had spontaneous delivery, one month before the expected date of confinement, of a small but healthy infant. On January 30, 1923, there was no glycosuria and a blood chemistry showed a glucose concentration of 0.093. She has remained well and sugar free to date.

CASE 2.—Mrs. A. C., thirty-three years old, seen for the first time on February 5, 1923. She had never been ill. She had one child five years old, normal pregnancy and labor. Her last menstrual period had occurred on August 11, 1922. She weighed 150 pounds. Examination showed normal head, neck, heart and lungs. Fundus uteri was 23 cm. above the symphysis pubis. Fetal heart sounds were normal. There was a lacerated pelvic floor and cervix. The blood pressure was 115 systolic and 60 diastolic. Urinalysis showed no pathologic finding. The patient felt well. On two subsequent prenatal visits there were no pathologic findings, but on March 19, 1923, a reduction of Fehling's solution was noted. The laboratory reports showed a glycosuria of 2 per cent and a blood-sugar concentration of 0.148 per cent. This patient was seen every week throughout the remainder of her pregnancy and was placed on a moderately restricted carbohydrate diet. The glycosuria persisted although the patient felt well. She delivered spontaneously

of a living child at term, on May 22, 1923. Puerperium normal. Examination on June 20, 1923, showed the absence of glycosuria and a blood-sugar concentration of 0.096 per cent. The patient has remained well and sugar free to date.

CASE 3.—Mrs. I. E., twenty-eight years old, seen on December 8, 1923, referred by her physician with a diagnosis of diabetes and pregnancy. She had never been ill before and was pregnant for the first time. Her last menstruation had occurred on April 8, 1923. She had felt perfectly well until a week before I saw her when she complained of a slight pruritis vulvae. Her family physician examined the urine and found a reduction of Fehling's solution. She felt well, her pruritis having been relieved by the use of an ointment. The blood pressure was 120 systolic and 70 diastolic. Fundus uteri reached 33 cm. above the symphysis pubis. A laboratory report showed that the reduction was due to a glycosuria 2.7 per cent, the blood showed a glucose concentration of 0.176 per cent. The patient was placed on a carefully restricted carbohydrate diet, but the findings persisted, and yet she felt perfectly well. She was delivered on February 2, 1924, by a low forceps operation. The child was large and had a harelip and cleft palate which was subsequently operated on at Bellevue Hospital. Several urinalyses done since have shown the absence of a glycosuria. "No blood examination was permitted."

These three cases differ fundamentally from the renal glycosuria and the intermittent glycosuria in that in each case there was a hyperglycemia in addition to the glycosuria. After delivery both the glycosuria and hyperglycemia disappeared. After the puerperium these patients were instructed to live on a low carbohydrate diet, were shown how to take moderate exercise, and were impressed with the fact that they must not permit themselves to grow fat.

CONCLUSIONS

1. In addition to the renal glycosuria and intermittent glycosuria of Wallis and Bose, the only two conditions that have been described as glycosuria occurring in the pregnant woman exclusive of true diabetes and alimentary glycosuria, another type exists that has not previously been described, pregnancy glycosuria with hyperglycemia, both the glycosuria and hyperglycemia disappearing after delivery.

2. If blood chemical examinations were made more frequently in the large prenatal clinics, many cases might be found which belong in this group.

3. This condition may be due to disturbed function of the thyroid or other endocrine glands during pregnancy, but I believe that it is a pre-diabetic condition.

4. Since cases have been reported where renal glycosuria in pregnancy subsequently developed true diabetes mellitus, it is reasonable to believe that cases of pregnancy glycosuria with hyperglycemia are even more apt to develop into cases of true diabetes mellitus.

5. These patients should be carefully observed for a long period after delivery, and urinalyses and blood-sugar determinations should be made at regular intervals so that if diabetes should develop an early diagnosis may be made.

6. They should be instructed to live on a restricted carbohydrate diet and should not be permitted to become obese.

REFERENCES

- (1) *Cron*: AMER. JOUR. OBST. AND GYNEC., i, 277. (2) *Williams*: *Obstetrics*, Appleton. (3) *Commandeur and Porcher*: Arch. gen. de med., 1904, exciv, 2241, 2325. (4) *Rowley, W. N.*: AMER. JOUR. OBST. AND GYNEC., v, 23. (5) *Wallis and Rose*: Jour. Obst. and Gynec. of the British Empire, 1922, xxix, 274. (6) *DeLec*: Principles and Practice of Obstetrics, Saunders. (7) *Joslin*: Treatment of Diabetes Mellitus, 1923, ed. 3, 476 and 649. (8) *Ravcno*: Jour. Am. Med. Assn., Dec. 22, 1923, lxxx, 2101. (9) *Percz*: Samana Med., Buenos Aires, ii, No. 34, p. 393. (10) *Bell*: AM. JOUR. OBST. AND GYNEC., iii, 20. (11) *Lemann*: New Orleans Med. and Surg. Jour. Jan. 1922, lxxiv, 492. (12) *Walsh, R. L. Mc.*: Medical Press, London, 1921, cxi, n.s. 400. (13) *Fletcher*: In Osler and McCrae's Modern Medicine, ii, p. 677. (14) *Foster*: Diabetes Mellitus, Lippincott, p. 99.

1458 UNION STREET.

EARLY CARCINOMA OF THE CERVIX*

BY ELISE S. L'ESPERANCE, M.D., NEW YORK

(From the Department of Pathology, Cornell University Medical College.)

THE early diagnosis of cancer is probably the most important subject in oncology at the present time and nowhere is this necessity greater than in malignant neoplasms of the uterus. It is a well-established fact, gleaned from the statistics, that cancers of the uterus are first in point of frequency of all malignant tumors in women, and occupy a doubtful second rank among all cancers in both sex.

There is still another reason for their importance. They not only rank high in point of frequency but even with the most modern therapeutic measures a record of over 50 per cent mortality still persists. There appears only one way to combat this deplorable state of affairs and that is by the recognition of the process in its earliest stages. To accomplish this desired solution, as the gross manifestations are often insignificant and in some instances inaccessible, one must become familiar with the earliest histologic changes which are known to precede the fully developed, highly destructive neoplasm.

Under the caption "preeancerous conditions" many atypical overgrowths of epithelium that have been shown to antedate the development of carcinoma, have been considered. A large amount of literature has accumulated on this subject and a long discussion has been waged over the term. Hansemann and Pick have vigorously denied that it is possible to distinguish histologically a preeancerous process, and many following this school of teaching deny the existence of such a lesion, contending that a case either is or is not a cancer. Just this theory it seems to me has been one of the great hindrances in the recognition of early carcinoma. That the carcinomatous process is a distinctly evo-

*Read before The Brooklyn Pathological Society, January, 1923.

lutionary one, having a starting point, pursuing a known course to a definite termination, is a well-known fact. Therefore, it seems reasonable to infer that one may encounter the disease in any one of its phases.

In a consideration of the subject of early carcinoma of the cervix, it seems desirable to mention the two distinct anatomical areas in the cervix: The portio with its stratified epithelium and the cervical canal lined by cylindrical cells and harboring in its stroma many racemose secreting glands. This complex character gives a very unusual picture to many of the pathological lesions encountered here and tends to encourage an astonishing facility for the transformation of cylindrical into stratified epithelium. (Fig. 1.)

Ruge and Veit, in discussing cervical carcinomas, maintain a rather sharp distinction between neoplasms arising from the cervical canal and

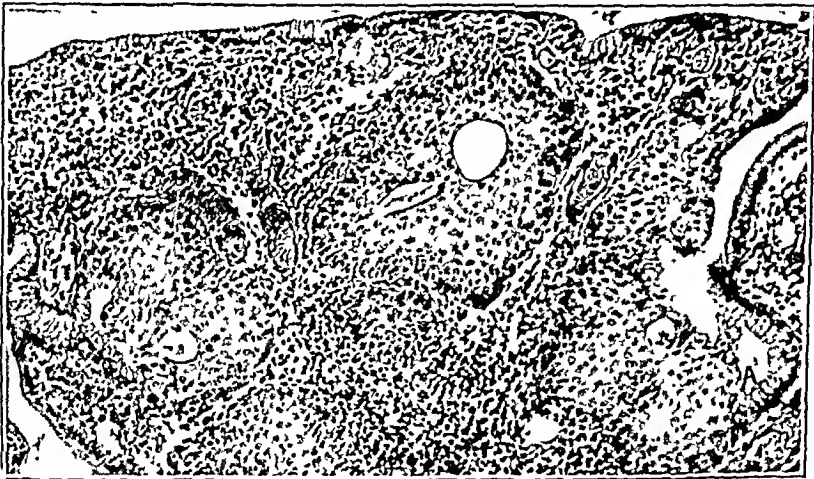


Fig. 1.--Cervical erosion with marked metaplasia. A shows sharp contrast between typical cylindrical epithelium and atypical stratified cells.

those taking their origin in the portio. After all, this can only be a classification based on anatomical and clinical data. From the histological standpoint no such distinction can be made. Many highly malignant tumors reveal an overgrowth of both types of cells and it is not unusual to find a squamous cell cancer arising within the cervical canal (Cullen) and *vice versa*, papillary adenocarcinomas are observed arising in the deeper structures of the portio.

The loose relationship which exists between stratified and cylindrical epithelium in this region results in active metaplasia. This may be variously interpreted. First it may be physiologic reaction frequently observed in the endometrium after the menopause (Klein and Mueller). On the other hand, islands of squamous cells have been described as occurring in the lining epithelium of the uterus in young infants (R. Meyer, Friedlander). Werth has found it associated with the regenerative changes following curettage. In long-existing inflammations it is

frequently encountered. Epidermization, therefore, may be considered as part of a physiologic process, as a congenital condition or as the result of prolonged irritation. It is in this latter relation to inflammations that it most frequently enters the picture of the precancerous process. The best explanation of this active epidermization, I have found, is that advanced by Hitschman. He suggests the possibility that the cells retain the latent embryonic character of the Mullerian duct, which is capable of developing indifferently either squamous or stratified epithelium. (Stone.)

The study of early carcinoma of the cervix is so closely related to cervical erosions and polyps that a brief review of them seems indicated. It has been stated that some form of chronic endocervicitis precedes cancer in over 75 per cent of cases (Polese). Persistent trauma with the resulting chronic inflammation, as a factor in the production of cancer, is fully proved in the literature. The fact that 95 per cent of women who develop carcinoma of the cervix have borne children, seems to confirm this statement.

Cervical erosions and cervical polyps undoubtedly contribute the largest percentage of so-called precancerous conditions and it is in them we encounter the best histological examples of a distinctly atypical epithelial proliferation. In the *papillary erosion* not infrequently one sees an atypical overgrowth combined with a gland hypertrophy and hyperplasia showing some of the features of an adenoma. This is well illustrated in case 5908. (Fig. 2.) Here there is an extensive glandular proliferation. The papillary structure is excessive, showing many areas with little if any stroma between contiguous papillae. In certain parts this overgrowth is so marked that it is difficult to determine whether early carcinoma has not already become established. There is, however, only a slight degree of anaplasia and very little hyperchromatism. Epidermoidization is marked but there is no evidence of active mitosis, and heterotopia and invasive qualities are absent. Therefore, we feel there is insufficient histological evidence to warrant the diagnosis of a beginning neoplasm.

Cervical polyps may precede or be associated with erosions and form a large group in which atypical proliferative changes are manifest. They usually tend to an excessive overgrowth of cylindrical epithelium, giving a glandular character to the picture. Fig. 3 will serve to demonstrate this structure. In this section we have a marked hyperplasia of glands so numerous as to rest one against the other, without intervening stroma. Mucoid degeneration of the epithelium appears as a prominent feature. The anaplastic qualities of the cells are slight and there is little hyperchromatism. Still, we consider this case precancerous on account of the degree to which the glandular overgrowth has progressed and the tendency to atypical qualities in the cells.

These two cases will serve as types of what we consider possibly as precancerous conditions in the cervix.

We base an interpretation of the precancerous lesion on the degree to which the proliferation has progressed and the histological characters of the cells. Where there is loss of normal stratified layers, an increase of staining reaction in the nuclei, with a tendency of the papillae to grow downward, the growth of cells, we believe, has passed the stage of inflammatory hyperplasia and is beginning to show some of the features of a malignant process. Therefore, the inference may be drawn that this pathological momentum of cell proliferation, the inciting factors continuing, may in certain instances pass beyond an inflammatory



Fig. 2.—Papillary cervical erosion, "precancerous."

reaction and become definitely neoplastic. That such a life history may be read in numerous cancers is fully attested in the literature (Rubin, Schauenstein, Cullen and Ewing).

There is another very important point in the consideration of cervical erosions and the apparent relation which they bear to early carcinoma. Ruge and Veit have long expressed the opinion that erosions were by no means innocent and unimportant. They may not only serve as the starting point of cancer, *but may also present an apparently benign mask, behind which early carcinoma gains a fatal headway.*

A discussion of precancerous conditions in the cervix, no matter how

brief, would be incomplete without mentioning a relatively rare but nevertheless characteristic atypical overgrowth of squamous epithelium, leukoplakia. Von Franque first described this lesion in the cervix and reported two cases, one of which developed cancer six years after the appearance of the leukoplakia patch. Just what relation this disease



Fig. 3.—Papillary glandular erosion marked by overgrowth of cylindrical epithelium.



Fig. 4.—Leukoplakia of cervix with thickening of stratified epithelium and hornification.

bears to syphilis is still undetermined. About one-half of the reported cases were associated with a luetic infection. Of the two cases described by Stone, one gave a definite luetic history, while in the other case no such history could be obtained.

Fig. 4 is a typical case of leukoplakia of the cervix associated with syphilis, which was apparently congenital. It shows very well the characteristic excessive epidermoidization of the stratified epithelium with

hornification. There is a tendency for the papillae to grow downward with irregularity of basal layer. We have in this instance a rather remarkable picture—overgrowth of surface epithelium beneath typical patches of leukoplakia, associated with a syphilitic history. Syphilis as a factor in cervical carcinoma is suggested in a recent series of cases in which 8 per cent gave a syphilitic history. (Martzloff.)

Leukoplakia of the tongue has long been considered as an etiologic factor in the development of epithelioma of the tongue and possibly it may hold the same undesirable position in the pathogenesis of certain cervical cancers.

With this short summary of precancerous lesions we may approach the subject of its relation to early carcinoma of the cervix. Just what do we mean by an early carcinoma and is it possible to differentiate it from a precancerous change? One must admit the task is fraught with difficulties. Nevertheless, I believe that a precancerous lesion is only a potential carcinoma; some but not all go on to develop cancer. Whereas early carcinomas are miniature, fully formed cancers which, if unmolested, will ultimately develop into highly destructive, malignant neoplasms. What are we then to consider as the criteria of a miniature carcinoma? The consensus of opinion in the literature seems to be that where there is a marked proliferation of anaplastic epithelium progressing beyond that encountered in the precancerous process; a downgrowth or heterotopia of atypical hypertrophied papillae, composed of anaplastic cells, wide variation in the size of the nuclei; one is justified in the diagnosis of early carcinoma. (Rubin, Schottlander, Kermauner, Ewing, Sehauenstein.) When we have added to this the development of epithelial pearls and various stages of active mitosis there is little doubt that one is dealing with a fully formed, though localized, malignant tumor. (Cullen.)

During the past few years, by a routine, histologic examination of all gynecologic material, we have obtained a series of cases which I believe illustrates the possibility of recognizing the earliest forms of cervical cancer.

The first case, 9444, may be grouped as an early epidermoid carcinoma of the portio. The patient, a widow fifty-two years of age and the mother of six children, complained of excessive and irregular bleeding. She had consulted several physicians and been told that her symptoms were referable to the menopause. Eventually she was referred to the New York Hospital where a complete hysterectomy was performed. An examination of the gross specimen revealed a uniformly enlarged uterus with thickened endometrium. The cervix was enlarged and cystic and at the edge of an old laceration there was an irregular eroded area about one and a half by two cm. in size. The border was sharply marked off from the smooth glistening surface of the portio and appeared slightly elevated. (Fig. 5.) The histologic examination of the endometrium shows a glandular hyperplasia with diffuse myomatosis. Sections were taken through the eroded area in the cervix and reveal an atypical proliferation of stratified epithelium which forms a sharp

contrast to the normal layers. (Fig. 6.) In one part these atypical cells are seen to invade the glands. The basal layer is missing and the cells lack differentiation, appearing as irregular polyhedral forms with absence of pavement character. The nuclei present interesting features. They are all deep staining and of various sizes and show phases of active mitosis. (Fig. 7.) Occasional pearl formation may be seen. (Fig. 8.)

In this case we have nearly all the criteria of a cancer process: Heterotopia and beginning invasive tendencies; atypical qualities of the cells; anaplasia; irregular and indefinite outlines of the cells; hyper-



Fig. 5.—Illustrates extensive erosion of cervix with cysts. A, Indurated area of early carcinoma as shown in following histologic sections.



Fig. 6.—Illustrates line of demarcation between normal stratified cervical epithelium and beginning loss of polarity and atypical overgrowth of cells. A, Normal; B, atypical.

chromatism with variations in size of the nuclei; active mitosis and pearl formation, in a localized growth. This suggests the early stage of a rather unusual carcinoma of the cervix, the acanthoma, in which epithelial pearl formation is a prominent feature.

Cullen has recently described a similar case arising in the cervical canal. He claims never to have seen epithelial pearls in any condition of the cervix other than cancer. Martzloff reports one which closely resembles that described, in which there was added an unusual variation in mitotic figures.

The criticism may be offered that one finds these changes in a pre-cancerous process. In refutation of this statement I would like to point out the fact that the histology of early carcinoma varies in different

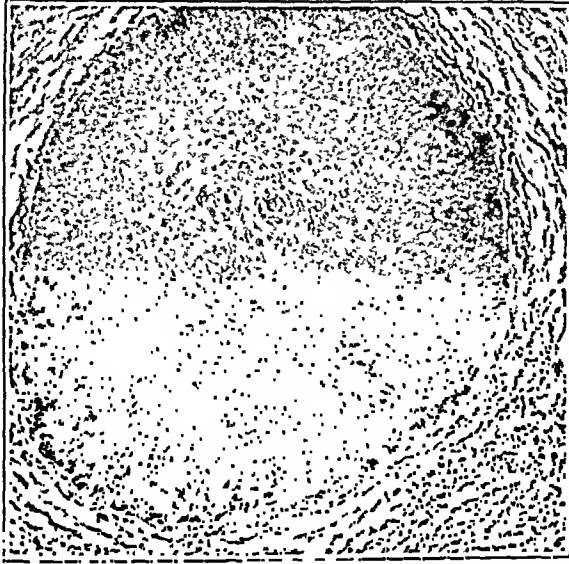


Fig. 7.—Island of atypical epithelium infiltrating deeper structures. Note variations in size of nuclei.

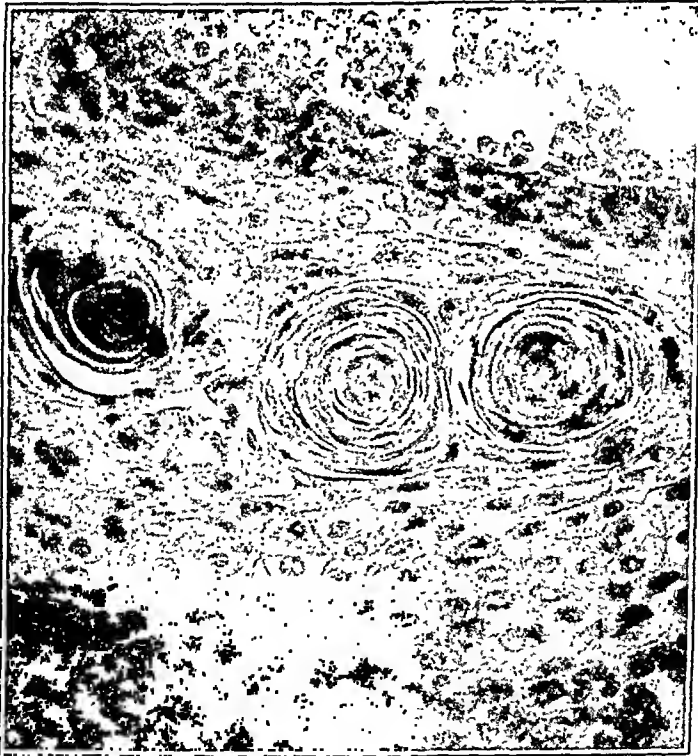


Fig. 8.—Characteristic pearl formation.

regions and what might be termed an inflammatory hyperplasia in one organ may well prove to be an early carcinoma in another situation. There are numerous illustrations of this specific organoid reaction.

Take, for example, the endometrium—adenomas here are practically always malignant, whereas the same degree of overgrowth in the thyroid gland is entirely benign. One might take for comparison the common papilloma of the skin which is usually benign but often shows an active mitosis and occasional pearl formation without indicating malignancy. I must agree with Cullen that in my experience pearl formation and active mitosis in the cervix, except in a malignant process, is extremely rare. Of course, mitosis must occur for the regeneration of tissue; nevertheless it is strange one encounters it so seldom in erosions and precancerous conditions in this organ.

The second case presents a different picture and might be classed as a very early plexiform epidermoid carcinoma. The patient, a married woman, forty-three



Fig. 9.— Distinct overgrowth of anaplastic stratified epithellum.

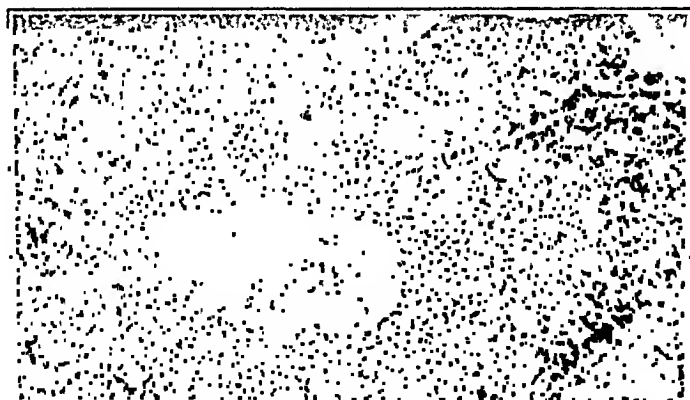


Fig. 10.—Cervical gland infiltrated with atypical transitional cells.

years old, and the mother of eight children, gives the common history of excessive and prolonged menstruation. Examination of the cervix revealed a small indurated and ulcerated area on the anterior lip, bleeding on the slightest trauma. A small piece of the eroded spot was removed for diagnosis.

On microscopical examination we find a more marked overgrowth of atypical stratified epithelial cells than that encountered in the first case. (Fig. 9.) There is a greater loss of differential character and more intense hyperchromatism. The variation in the size of the nuclei is prominent. Strands of imperfectly outlined cells pierce the stroma, encroaching on the glands. In one area a gland appears infiltrated with anaplastic, transitional cells, forming a localized focus of typical cancer. (Fig. 10.) The morphologic changes in this case are more apparent

and seem to illustrate a more fully developed, though early cancer. On gross inspection in this case, we have a *demonstrable lesion*, which a keenly alert surgeon recognized as suspicious. The growth undoubtedly has progressed to a more characteristic neoplastic stage than the first case. Still, it is distinctly localized and offers an excellent chance of permanent cure.

In the third case we have not only an unusual neoplasm, but the age of the patient would not suggest a malignant tumor. She was a married woman, twenty-



Fig. 11.—Extensive papillary overgrowth of cylindrical epithelium. Papillary adenocarcinoma of cervix.

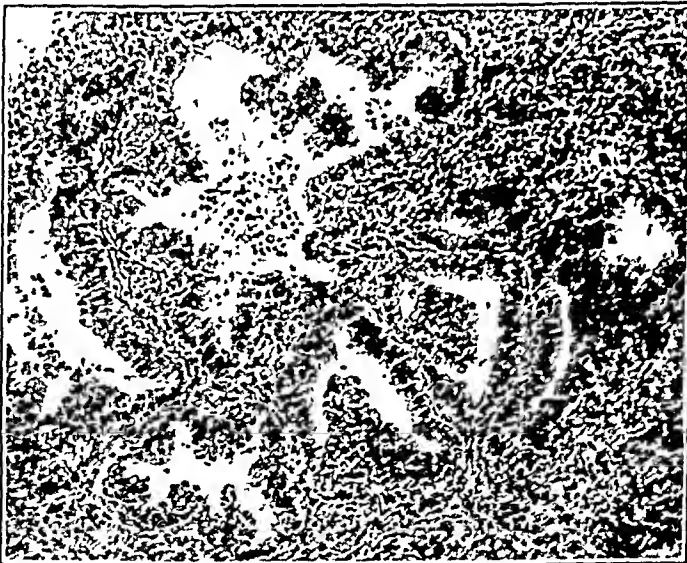


Fig. 12.—Reveals more anaplasia than previous section, with distinct hyperchromatism and invasion.

two years old, and had had one child. The complaint, as usual, was prolonged and excessive menstruation. On examination, the cervix appeared hypertrophied with ectropium. The external os was widely open and filled with a fungating mass composed of fingerlike processes of considerable length. They were deep red in color and bled easily. The epithelium of the portio was eroded and granular; this erosion involved both lips. A small piece of tissue was removed from the polypoid mass for diagnosis. Microscopical examination shows a hyperplasia of

papillae covered by one or more layers of deep staining gland epithelium. The growth is irregular, with branching strands interlaced with one another. (Fig. 11.) The glandular character is maintained throughout. The degree to which the hyperplasia had progressed, the atypical qualities of the cells, the hyperchromatism of the nuclei with invasion, demonstrates the malignant character of this process. (Fig. 12.)

The point of interest in this case is the age of the patient. Carcinoma of the cervix in a woman under 25 years is relatively rare and, when it does occur, is apt to pursue a more rapid course.

Early adenocarcinoma, involving the portio and apparently bearing a more or less direct relation to a papillary and glandular erosion, is not frequently observed.

There is evidence here, I think, of the probable histogenesis of some forms of papillary adenocarcinomas of the cervix from the glandular overgrowth in erosions. The question may be raised and justly that the bulk of the tumor protruded from the os, but in answer to that the statement may be made that a bulky papillary growth involving the portio in the region of the external os would give the impression of protrusion from the opening. It seems quite possible that the glandular overgrowth we have observed in similar erosions may have been the starting point of this particular neoplasm. This is further confirmed by the fact that there was an associated erosion in this case.

The fourth (9583) and last case is one of fully malignant carcinoma arising in the stratified epithelium of the portio. The clinical history is not available. Inspection of the gross specimen reveals an enlarged uterus with elongated hypertrophied cervix. Surrounding the external os there is an annular ulcerated area involving both lips of the cervix and extending nearly to the fornices. (Fig. 13.) There is some induration and on cross section only slight infiltration and excavation appear. The histologic picture is that of a fully malignant plexiform carcinoma. (Fig. 14.) Strands of atypical anaplastic epithelium form a network of interlacing cords pushing their way into the stroma. This plexiform arrangement is characteristic of the majority of carcinomas in the portio.

By this series of cases we have attempted to demonstrate the early stages through which cervical carcinomas pass in their evolution to destructive, malignant neoplasms. We feel that they illustrate the various types involved in this process. First, the early epidermoid cancers of acanthoma structure with pearl formation. These are infrequent but, as in other localities, they develop rapidly. Second, the common transitional form of plexiform epidermoid carcinoma, which usually falls into two distinct groups. One, spreading widely over the surface, extending even to the vaginal wall, without deep infiltration or ulceration, is eradicated with difficulty even in the early stages. The other arising in a small focus appears to have a lessened rate of growth and may be completely removed if recognized early.

What gross anatomical structures do carcinomas of the cervix present and how can we recognize them by clinical examination? There is one

form appearing as a small indurated ulcer near the external os. This is circumscribed and superficially seems localized. But while maintaining this limited surface lesion, it early infiltrates the deeper structures, giving an increased hardness to the cervix. This renders complete removal difficult except in the earliest stages. These small ulcers bleed easily, thus differing from the erosion. As the disease progresses, larger



Fig. 13.—Fully malignant early carcinoma of cervix.



Fig. 14.—Fully malignant carcinoma of cervix.

areas of the portio are involved and there is beginning excavation. Gradually the lesion extends and involves the entire portio in an excavated necrotic tumor mass.

Another form occurs as a papillary outgrowth on the portio or just within the cervical canal. This small papilloma gradually increases in size, spreading superficially to cover the entire portio. Its progress is characterized by the superficial growth of cauliflower-like masses which

may entirely fill the vagina and produce implantation tumors on the vaginal wall. This type gives visual evidence even in the early stages and on account of the feeble infiltrative qualities it possesses, presents a favorable field for radical removal, if recognized early.

The most insidious form is one arising in the deeper tissues of the portio or in the cervical canal. These grow without giving evidence of their presence until well advanced. They usually extend in an annular ring in the deep structures of the cervix. This may give a peculiar denseness to the cervix when the tumor is fully developed. The surface of the portio long remains uninvaded. In fact, in one case of this kind which I observed at autopsy there was complete excavation and destruction of the cervical canal, perforation into the posterior culdesac with generalized peritonitis, yet the external os was closed and the portio presented a smooth, unbroken surface. Fortunately, these deep cancers of the cervix are relatively rare, for in this disease gross inspection is practically useless. In Cullen's case of early carcinoma, which we have referred to, the growth was situated just above the internal os in a position beyond the reach of any mode of diagnosis except the curette. It was only recognized in this instance in routine histologic examination of curettings from a myomatous uterus. *The value of curettage combined with microscopical examination cannot be overestimated in the diagnosis of all early cancers of the uterus.*

The course of cervical cancers has considerable influence on the unsuccessful treatment. Early involvement of the parametrium and regional lymph nodes is the rule in the infiltrating form, and is found in the mature cancers of all types. This takes place by direct permeation or through the lymphatics. Baisch concludes that regional nodes are invaded in 33 per cent of operable cancers of the cervix. The rate of growth appears to be slower after involvement of the parametrium and there is little tendency to involve distant regions. Nevertheless, extension to contiguous structures, bladder and rectum, may be relatively early.

The early diagnosis of carcinoma of the cervix is the goal toward which we are striving and it may well be asked just how this desirable aim may be accomplished. In reviewing the clinical histories of our cases and those presented in the literature, one is impressed with the insignificance and often entire absence of clinical manifestations of the disease in its incipient stages. Irregular and excessive menstruation, the common symptom, may indicate the presence of any one of a number of pathologic conditions in the uterus. But irregular bleeding in women over 35 years, or the apparent reappearance of menstruation after the menopause is sufficiently important to warrant a thorough investigation to determine if possible the cause of the symptom and the nature of the disease. If inspection of the cervix reveals even a small cervical lesion, it should be regarded as potentially a precancerous process and tissue removed for histologic study.

If we can create a highly suspicious attitude in the minds of clinicians toward all cervical lesions in women of cancer age, no matter how seemingly innocent they may appear, and if we emphasize sufficiently the importance of histologic examination of routine gynecologic material, especially tissue removed from the uterus and cervix, a distinct advance toward the early diagnosis of cancer will have been made.

These clinical suggestions are all very well for those patients who consult a physician for some definite symptom. Unfortunately, leucorrhea, menorrhagia and metrorrhagia are usually found as late manifestations of the fully established disease. How then are we to reach the early cases, presenting no clinical symptom of sufficient importance to indicate the need of a physician? Undoubtedly, by the systematic vaginal examination of women in the cancer zone, especially those who have borne children, to the end that any damage sustained at the time of delivery may be repaired and thus one factor in the production of cancer removed.

The objection has been raised that it is almost impossible to persuade women to submit to this routine examination. This objection must be met by a broader education of the public in the known facts regarding cancer; impressing on them curability if treated early and then instill into their minds the idea that consultation with their physician is not a serious matter and does not mean a radical operation. They do not feel alarmed when they consult a dentist semiannually. Why then should they entertain any dread to submit to a physical examination at regular intervals? We are all creatures of habit. If this routine examination could become as casual a procedure as our visits to the dentist, we would have removed one of the greatest obstacles in the control of cancer in women.

When we bring the public to the point of realizing that cancer is a curable disease if recognized early; when we have supplied proper facilities for routine examinations; when we have impressed the physicians with the importance of complete physical examinations, no matter what the predominating symptom may be, and when we add to this a broader knowledge of the early gross and microscopical changes encountered in the incipient stages of cancer, we will have accomplished much in lessening the mortality from carcinoma of the cervix.

BIBLIOGRAPHY

- Klein*: München. Med. Wchnschr. 1897, xxiii, 616. *Mueller*: Samml. Klin. Vohrt., 1906, 413. *Cullen*: Cancer of Uterus, 1909, W. B. Saunders. *Stone*: Surg., Gynec. and Obstet., 1916, xxiii, 248. *Polace*: Zentralbl. f. Gynaek., 1906, xxx, No. 9, 284. *Rubin*: Am. Jour. Obstet., 1910, lxii, No. 4, 668. *Schauenstein*: Gynaek. Rundschau, 1907, i, 1, 14-15, 17, 574, 605. *Schauenstein*: Arch. f. Gynaek., 1908, lxxxv, 576. *Ewing*: Neoplastic Diseases, 1922, Ed. 2. W. B. Saunders Publ. *Von Franque*: Zeitschr. f. Geb. u. Gyn., 1907, ix, 237. *Von Franque*: Zeitschr. f. Geb. u. Gyn., 1901, xlv, 173. *Schottlander-Kermanner*: Zur Kenntniss des Uterus Karzinoms, 1912, Berl. S. Karger. *Cullen*: Surg., Gynec. and Obstet., 1921, No. 2, 137. *Martizloff*: Johns Hopkins Bull., 1922, xxxiii, No. 376, 221.

THE STATUS OF RECTAL EXAMINATIONS IN LABOR

A SURVEY OF THE LITERATURE AND AN ANALYSIS OF ONE THOUSAND CASES

BY RALPH A. REIS, M.D., CHICAGO, ILL.

(From the Maternity of the Michael Reese Hospital.)

THE frequency with which the subject of rectal examinations during labor has appeared in the literature of the past few years denotes a renewed interest in this procedure. Especially is this true of the German literature where many discussions have taken place in attempting to evaluate the rectal examination and to give to it the position which it deserves in the conduct of labor.

Ries¹ and Kroenig,² working independently, were the first to advocate rectal examinations during labor and reported their results within a few weeks of each other. The impetus for these reports lay in the persistence of puerperal fever due to extraneous contamination in spite of all attempts at disinfection of the external genitalia and of the operator's hands.

Oliver Wendell Holmes³ in 1843, and Semmelweis⁴ in 1847, were the first to show that puerperal fever is usually due to infection from external sources, and since then numerous attempts have been made to develop a technic which will eliminate this source of danger. It was to this end that Pinard⁵ first described the method of obstetric diagnosis by external examinations alone, although it was not popularized until Crede⁶ and Leopold⁷ proved the practical value of this technic. Williams⁸ states that "under ordinary circumstances, external or abdominal palpation is the most reliable and valuable method." Von Mikulicz-Radecki⁹ and many others, however, are not in accord with this view, the former believing that it is accurate in only 70 per cent of the cases.

Kroenig² in his original report holds that a correct diagnosis can be made by rectal examination alone and Ries¹ recommends that the vaginal examination be reserved for operative deliveries and placenta previa only. Briggs¹⁰ agrees with Ries and Kroenig that the diagnosis of the size and form of the bony pelvis, presentation and position, fetal size, and the condition of the membranes and of the cervix can be made by rectal examination. Randolph Holmes¹¹ states that the rectal examination is the best because there is less infection and only a small percentage of error. Kehrer¹² conducts 95 per cent of his deliveries by rectal examinations alone. Fuerst¹³ uses vaginal examinations only for disproportion, hemorrhage, and bloody urine. Pfleiderer¹⁴ goes so far as to say that the rectal examination is better than the vaginal examination in determining the size of the pelvis because the rectum is more movable than the vagina.

Moore¹⁵ states that the "rectal examination is not sufficient for the intelligent management of labor." Liegner¹⁶ uses the rectal route if the head is low, but, with the head still high in the pelvis or the cervix uneffaced, places no reliance upon this method. He believes that a rectal examination is more difficult because of the thickness of the rectovaginal wall and because of the rectal folds. He also lays great stress upon the danger of carrying infection into the uterus by forcing the rectovaginal wall into the dilated cervix.

Fuerst reports that he has done rectal examinations on 18,000 patients and states that he has never seen any injury to the rectum. Von Mikulicz-Radecki proctoscoped

a large number of patients in order to determine whether or not any injury had been done to the rectal wall. Only an occasional hyperemia of the anterior rectal wall could be seen but this was also found in a large number of control cases which had not been subjected to rectal examinations and so could not be attributed to this procedure, but rather to the pressure exerted by the descending head. It must be conceded, however, that in unskilled or rough hands direct injury can be done to the rectal wall as well as to the anal mucosa.

Heynemann²¹ opposes the use of the rectal examination alone because it is unreliable and uncertain and states that the complications of labor are too often overlooked. He employs rectal examinations only after a thorough vaginal examination has been made and believes that this is the true function of the rectal examination, viz., as a supplement to a careful vaginal examination to watch the progress of labor.

Several workers have investigated the comparative morbidity following rectal and vaginal examinations in order to determine whether more cases of increased temperature due to pelvic infections followed either type of examination. Schuster¹⁷ reports that 17.2 per cent of those cases examined per rectum only had temperatures over 100.4° and that 22.2 per cent of those examined vaginally had temperatures over 100.4°. Perrola¹⁸ states that temperature occurred in 21 per cent of those examined rectally and in 22 per cent of those examined vaginally. Pankow¹⁹ finds that pelvic infections follow in 7 per cent of the cases examined rectally and in 8.1 per cent of those examined vaginally. And finally, Guggisberg²⁰ finds that 17.5 per cent examined vaginally had temperatures over 99.5° and 11.2 per cent had pelvic infections while of those examined rectally, 11.2 per cent had temperatures over 99.5° and only 5.5 per cent developed pelvic infections.

In this investigation an attempt was made to determine what differences, if any, in morbidity rate and infection rate occurred following the two types of examination in a well conducted maternity. During the period from April, 1922, to June 1, 1923, there were delivered in the Maternity of the Michael Reese Hospital, 1528 patients. Of this number, 528 patients were examined both vaginally and rectally and were therefore not available for this study. Fourteen patients developed respiratory infections and could not be included in this series on that account. There remain, therefore, 986 deliveries of which 609 were conducted by vaginal examinations only, 271 which were conducted by rectal examinations only and 106 which were not examined internally. This latter figure includes deliveries conducted by external examinations only, precipitate labors, and other cases which, for one reason or another, were not subjected to an internal examination.

In this series, the majority of cases was examined vaginally because the routine care of service cases in the Michael Reese Maternity requires one careful vaginal examination immediately upon admission and preparation of the patient. The only exceptions to this routine are cases of appreciable vaginal bleeding or patients whose histories, measurements or abdominal examination might indicate the possibility of a cesarean section. It should also be stated that the patients, upon admission, are shaved and rinsed externally with sterile water, no antiseptic solutions or douches being used.

Any patients showing more than one-half (0.5) degree rise in temperature at any time during the first seven days postpartum were considered, for the purposes of this investigation, as being febrile. Only the first seven days were considered because it was felt that any temperature developing after that time should not be connected with the type of examination used during labor. Of the 609 patients examined vaginally, 289, or 47 per cent, were afebrile during this period; of the 271 examined rectally, 122, or 46 per cent, were afebrile; and of the 106 patients not examined internally, 60, or 56 per cent, were afebrile.

If we exclude all cases in which any type of operative procedure or repair work was done and consider only the spontaneous cases, the percentages of afebrile cases increase accordingly, but in the same relative proportion to each other. There were 377 spontaneous cases in the vaginal group of which 216, or 57 per cent, were afebrile. In the rectal group of 105 spontaneous cases 57, or 54 per cent, were afebrile and in the group not examined, consisting of 82 spontaneous cases, 51, or 64 per cent, were afebrile.

AFEBRILE CASES		
	ALL CASES	SPONTANEOUS CASES
Vaginal only	47%	57%
Rectal only	45%	54%
No examination	56%	64%

In the vaginal group, 36 cases, or 5.9 per cent, showed definite evidences of pelvic infections as compared with 17 cases, or 6.3 per cent, in the rectal group and 5 cases, or 4.7 per cent, in the group not examined. If here again only the spontaneous cases are considered, there are 20 cases, or 5.3 per cent, of pelvic infections in the vaginal group, 7 cases, or 6.6 per cent, in the rectal group, and 4 cases, or 4.9 per cent, in the unexamined group which showed pelvic infections.

PELVIC INFECTIONS		
	ALL CASES	SPONTANEOUS CASES
Vaginal only	5.9%	5.3%
Rectal only	6.3%	6.6%
No examination	4.7%	4.9%

In the group examined vaginally, there were 107 which were subjected to two or more vaginal examinations. The percentage of afebrile cases among this group was 29 per cent as compared with 49 per cent among the remaining 502 cases which were only examined once during labor. The percentage of infections in this group of 107 was 10.3 per cent as against an infection rate of 4.6 per cent in those examined but once.

It would seem, from a study of the figures presented above, that the percentage of absolutely afebrile cases is definitely increased when neither rectal nor vaginal examinations are made and conversely that the percentage of pelvic infections is definitely decreased. There appears, however, to be practically no difference between the group examined

vaginally and the group examined rectally. This holds true for the percentage of afebrile cases as well as for the percentage of pelvic infections. If then, as most workers agree, the rectal examination is only 90 per cent efficient for diagnosis, and if it is especially inadequate in abnormal and pathological cases, it would seem that at least one vaginal examination is desirable early in every case of labor, particularly since there is no increased danger of infection from such an examination if carefully and properly done. That the number of vaginal examinations should be limited as much as possible is self-evident from a study of the figures presented.

The rectal examination is, however, of value in observing the progress of labor and should supplement the initial vaginal examination. The rapidity and ease with which the rectal examination can be made recommend it strongly, but it does not seem that the rectal examination should replace the vaginal examination especially in a well-conducted maternity where vaginal examinations can be made under aseptic conditions.

REFERENCES

- (1) *Ries, E.*: Zentralbl. f. Gynäk., 1894, xviii, 404. (2) Zentralbl. f. Gynäk., 1894, x, 203. (3) Medical Essays, 1891, Houghton, Mifflin Co., New York. (4) *Semmelweis, I. P.*: Gesammelte Werke, 1905, G. Fischer, Jena. (5) Traité du palper abdominal, 1878, Paris. (6) Die Geburtshilffliche Untersuchung, 1892, S. Hirzel, Leipzig. (7) Arch. f. Gynäk., 1894, xlv, 337. (8) Obstetrics, 1921, D. Appleton Co., Philadelphia. (9) Zentralbl. f. Gynäk., 1922, xlvii, 1239. (10) Am. Med. 1902, iii, 194. (11) Jour. Am. Med. Assn., 1915, lxxv, 2229. (12) München. med. Wehnschr., 1921, lxviii, 1208. (13) Ztschr., f. Geburtsh. u. Gynäk., 1923, lxxxv, 469. (14) München. med. Wehnschr., 1920, lxvii, 116. (15) Am. Jour. Obst., 1917, lxxv, 225. (16) Zentralbl. f. Gynäk., 1921, xlv, 194. (17) Inaugural Dissertation, 1911, Heidelberg. (18) Revue française de Gyneec. et d. Obst., 1922, xvii, 6. (19) Arch. f. Gynäk., 1922, cxvii, 44. (20) Arch. f. Gynäk., 1922, cxvii, 44. (21) Monatschr. f. Geburtsh. u. Gynäk., 1921, lvi, 1.

29 EAST MADISON STREET.

THE ROLE OF THE INTERNIST IN AN OBSTETRIC HOSPITAL*

BY W. W. HERRICK, M.D., NEW YORK

(From the Department of Obstetrics and Gynecology and the Department of Medicine, College of Physicians and Surgeons, Columbia University, New York City)

OBSTETRICS presents a twofold problem; one surgical, the other medical. The surgical problem is, under modern conditions, admirably dealt with and needs no comment from medical sources. The medical problem has always been subordinate to the surgical and opportunity for its study but seldom given to the medical specialist. Here, then, is an inviting field for the application of newly developed methods of clinical study. The day of the special hospital set apart in isolation and devoted to a single branch of practice is fast drawing to a close. Co-ordination is the keystone of modern medicine. In every hospital, be it general or special in purpose, there is place for the internist and for representatives of other branches of practice. It is only in the pooled contributions of such a varied staff that the patient may reap the benefit of the best modern practice.

Although a physiologic process, child-bearing is such a great strain upon the modern woman that latent defects are likely to be revealed. I believe that in many cases one can detect the pathologic trend of a given individual by careful study during and after pregnancy. In such a study knowledge of the life history of the patient shares equally in importance with the data obtained by physical examination and from the laboratory. It is, then, as a revealer of latent pathology that pregnancy is of particular interest to the internist. With this viewpoint in mind more particular inquiry may be made into the part of the medical man in the service of an obstetric hospital. Medicine may contribute to obstetrics in the care of three general classes of cases. First, those presenting infections. Second, those with cardiac insufficiency. Third, the toxemias.

THE MEDICAL MANAGEMENT OF INFECTIONS IN PREGNANCY

In a brief discussion, pyelitis, appendicitis, cholecystitis and similar local inflammatory conditions, the management of which is largely surgical, may be omitted. Excepting tuberculosis and syphilis, the infections in pregnancy offer few new problems to the medical man. Management of pneumonia, typhoid fever, the exanthemata, etc., while complicated by the presence of the fetus, call for no peculiar measures.

*Read before the meeting of the Sloane Alumni, January 25, 1924.

Specific treatment is given where indicated as in the nonpregnant. If it seems wise to give serum, extraordinary precautions to avoid anaphylaxis are demanded. As a general rule the pregnancy is largely ignored in the management of infections. The termination of pregnancy because of a coexisting infection is probably always unwise, and every effort should be made to prevent abortion during the acute stages of a serious infection. A matter of medical importance is the tendency of pregnancy to activate latent infections. This comes into particular consideration in tuberculosis. In patients with healed lesions the most careful medical supervision must be had throughout pregnancy and at the first sign of lighting up of the smouldering infection the measures advised in active cases are to be taken.

The proper management of syphilis during pregnancy is of the highest importance. Treatment must be as thorough as the tolerance of the patient will allow. While arsenicals can be used freely in the average case, extraordinary care must be taken in cases having any evidences of toxemia, lest acute hepatic degeneration be precipitated.

From the viewpoint of maternal safety active tuberculosis and pregnancy are incompatible. The point of greatest practical difficulty is in diagnosis. Often much judgment is required to be certain that one is dealing with tuberculosis rather than with some of the varied pulmonary infections due to other organisms than the tubercle bacillus which have been so common since 1918. If one is assured that a given condition is tuberculosis, the following general rule, already widely accepted by obstetricians, may apply to most situations. In the presence of active tuberculosis in a patient before the fourth month of pregnancy, therapeutic abortion should be done. If pregnancy is advanced beyond the fourth month, it is usually as well to allow the pregnancy to proceed to term, since forced labor after the fourth month is a serious procedure and one not well borne by the tuberculous patient. Further, experience has shown that cases allowed to go to term do not do much worse than those delivered between the fourth month and term.

THE MANAGEMENT OF CARDIAC INSUFFICIENCIES IN PREGNANCY

At the Sloane Hospital it is felt that the management of cardiac patients has been put upon a sound and effective basis. The method is as follows: Cardiac cases detected in the antenatal clinic are at once assigned to a special cardiac clinic for pregnant women. In this clinic such cases are observed as often as necessary, usually every two weeks. At the first sign of decompensation, hospitalization is enforced until compensation is restored. In many instances, cases undergo two or three periods of hospital care during a pregnancy. When possible, these cases are carried along in this manner until term. The pregnancy is in general ignored and the therapeutic effort concentrated upon maintaining cardiac efficiency and preparing the heart for the strain of

labor. There are few cases of chronic cardiac disease that cannot be maintained in safety by this program up to the time of delivery. It can be said that the average pregnant cardiac case responds to medical measures quite as well as the nonpregnant case. The treatment of the pregnant and nonpregnant woman with cardiac insufficiency, presents very little difference. If compensation cannot be restored by medical treatment, delivery must be effected. Delivery at viability of the fetus or at term, is usually accomplished by natural methods without special danger to the patient. In a few cases in which compensation cannot be fully restored and in which the additional strain of labor promises to be a menace, or in which obstetric conditions promise a difficult labor, cesarean section is undertaken with the knowledge that this is well borne by the average cardiac case. The traditional fear of ether in the case with chronic cardiac disease is not justified by experience. These cases bear ether anesthesia well. Complete anesthesia during the second stage is with little question a valuable aid in relieving strain on the heart. The chief purposes in the management of pregnant women with heart disease are: (1) To prevent cardiac breakdown during pregnancy by hospital care whenever premonitory symptoms of decompensation are detected. (2) Never to undertake delivery during a period of serious decompensation but to postpone any interference until circulatory equilibrium is at least partially restored. (3) To avoid undue strain during the second stage of labor by appropriate obstetric measures. With such a program most ambulatory cases of chronic heart disease can with reasonable safety be permitted the privileges of maternity.

From October 1, 1921, to February 1, 1924, sixty-six cases of chronic cardiac disease have had prenatal care in the Cardiac Clinic. Of these fifty-three have been delivered in the Sloane Hospital. Five were delivered by abdominal cesarean section, one by abdominal hysterotomy. Of the thirteen cases not confined in the hospital, one was aborted at home, five were confined elsewhere, and seven were not yet delivered. Of the fifty-three patients delivered in the hospital, all left the hospital in good condition. Forty-seven infants left the hospital in good condition. Of the six infants that died, one was a stillbirth, one died in the hospital, one was in a case of abdominal hysterotomy with non-viable fetus, two were premature and one died soon after leaving the hospital.

THE MEDICAL MANAGEMENT OF THE TOXEMIAS OF PREGNANCY

A fascinating field for medical study is offered by the toxemias of pregnancy. It is a fertile field for the clinical investigator because these toxemias can be studied under controlled conditions and with definite associations. In their proper study I believe may lie the solution of some important clinical problems, such as those of hypertension and certain nephropathies. It has seemed to us that this problem should not be approached with preconceived ideas, however authoritative their

sanction. As soon as one subscribes to a dogma, the mind is less pervious to new impressions, progress is difficult and truth obscured. It has been our practice to make a study of several hundred cases of toxemias as they occurred in the service without being prejudiced by theories and on the basis of this experience to examine the facts. An admirable statistical summary of this study has been made by Dr. E. E. Bunzel, of the Sloane Hospital, to whose painstaking observations I am much indebted.

It is important to note that the search for a specific toxin in the toxemias of pregnancy has met with failure. To postulate such a specific toxin is easy, but in the absence of concrete evidence it does not advance us toward a solution of the problem. Neither have the newly developed methods for the chemical analysis of the blood contributed greatly. They have, to be sure, served to differentiate the type of toxemia with renal insufficiency from the other types, but beyond this their value has been largely on the negative side. Without wishing to formulate a theory, our impression from the study of several hundred cases is that toxemia of pregnancy is not a unit condition. It cannot, like true uremia, be caught in a test tube. We believe a different viewpoint will help us toward a broader appreciation of the problem. Instead of regarding toxemia of pregnancy as an entity, we would regard it rather as the reaction to the strain of pregnancy of a maternal organism in some way substandard. In the study of other obscure clinical problems when speculation fails us, recourse to description of the associated phenomena is frequently illuminating. For example, the cause of hypertension is altogether unknown. Theories fail, but careful description of the various clinical conditions exhibiting hypertension gives us information of great practical value and indicates lines along which the problems may eventually be solved.

If, in a consideration of the toxemias of pregnancy, we, for the time, abandon unsatisfying theories and, in intensive study of a large number of cases, analyze the features that are associated with the condition we may illuminate our problem. Such an analysis has thus far indicated a classification of the toxemias of pregnancy into a number of groups,—some seemingly definite, some less defined. Study of a classification of this sort would seem to indicate the correctness of the view that in the toxemias of pregnancy we have a broad, inclusive group of conditions which require such subdivision in order to be intelligently comprehended and managed. As these sub-groups are considered it will be noted that each centers about an important defect in the maternal organism, a defect that apparently antedates the pregnancy. Appreciation of this fact is important. It leads up to a general conclusion that toxemia of pregnancy does not occur primarily because the woman is pregnant: rather does it occur primarily because the woman has defective health and cannot maintain her physiologic equilibrium under the strain of pregnancy.

The most definite group of toxemias is that associated with renal insufficiency. These patients often have history of scarlet fever, tonsillitis, or other severe infection, frequently with subsequent nephritis in childhood. It is an unfortunate fact that modern tests of renal function do not reveal minor degrees of renal damage. They give no evidence of trouble until the factor of safety in the kidney is practically abolished. In what we may call a renal type of the toxemia of pregnancy the patient has enough kidney for one but not enough for two. As pregnancy advances, therefore, an increasing degree of kidney insufficiency is revealed. We see all the phases of an acute or subacute nephritis develop before our eyes,—headache, edema, possibly convulsions; anemia, hypertension, retinitis, scanty urine, albuminuria, cylindruria and the definite chemical evidence of the retention of uric acid, urea and creatinin in the blood. Given such a case we can feel assured that with each successive pregnancy a higher degree of renal incompetency will be revealed and that each future pregnancy will be attended with increasing risk. In addition there is the increased strain in the interval which comes in the home with a growing family. It is in such cases that the Social Service Department of a modern hospital can prove its value. Only a small percentage of toxemias can be placed in this group. If tests for renal function are developed which can reveal slight degrees of renal damage, this group may prove to be larger than we at present suppose. The management of this type of case is that of an acute or subacute nephritis. A diet poor in protein and salt is given. The amount of fluid allowed is varied according to the retention of water and the ability of the kidney to produce a concentrated urine. Activity of the skin and bowel is promoted. Rest and warmth are secured.

The second clinical type of toxemia of pregnancy is built upon a foundation of cardiovascular instability, such as precedes or accompanies the so-called essential arterial hypertension. These individuals usually have a family history of hypertension, arteriosclerosis, of apoplexy or cardiac disease. They are found most often among those who have an inheritance of active, urban ancestors. In many instances this vasomotor instability can be detected long before the establishment of permanent hypertension. This may be done by studying the blood pressure reaction to stress,—particularly psychic stress. For example, if the blood pressure is first observed during complete rest, then during conversation dealing with anything having particular interest or emotional tone, the rise in systolic pressure is greater than that commonly found in the average person. If the pressure thus elevated does not promptly return to the previous figure with cessation of the stimulus exciting the rise, and if this exaggerated reaction is consistently present on different occasions, such an individual may be said to have an unstable or labile blood pressure and one likely to become increasingly and more con-

stantly elevated with the passage of time. It is in the type of individual showing this lack of vasomotor poise that the cardiovascular type of toxemia frequently develops during pregnancy. In this hypertension is the outstanding feature. The rise is in both systolic and diastolic pressure. It may be the sole indication of disturbance or may, after weeks of gradual increase, be attended by albuminuria, convulsions, jaundice and other evidence of more serious and widespread disturbance. In cases of this kind there is no demonstrable evidence of renal insufficiency. The blood chemistry is usually quite normal and the capacity of the kidney to excrete water and salts unimpaired. Complications of a mechanical sort such as left ventricular hypertrophy with cardiac dilatation and pulmonary edema or apoplexy may develop in some. While the blood pressure in cases of this kind may promptly return to normal with death of the fetus *in utero* or with delivery, too often the hypertension is permanent. One may be able to watch the establishment of an enduring hypertension in successive pregnancies,—pressure returning to normal after earlier pregnancies to remain elevated after the later ones. Bunzel in his study of 134 cases of toxemia of pregnancy from one to two years postpartum found hypertension, vascular retinitis, arterial degeneration or albuminuria in 42 per cent, thus giving valuable proof that we are dealing with no transitory condition. The influence of pregnancy upon the development of essential hypertension is a study of greatest importance. Careful observation during pregnancy will reveal in many women the earliest evidences of the cardiovascular disturbances that play such a vital rôle in later life.

A further associate of toxemia is focal infection. The effect upon the pregnant woman of the added burden of pyorrhea, apical abscesses or severely infected tonsils seems to be marked. The proof of this is the notable clinical improvement in symptoms of toxemia not infrequently following eradication of such foci. In some instances during the course of the pregnancy, evidences of toxemia decline or vanish with the clearing away of such infections. In others, subsequent pregnancies are attended with less toxic disturbance. This observation is proof of the value of routine dental examinations in the antenatal clinic. The influence of extra-oral foci as those in the kidney, gall bladder, lung, etc., upon toxemia of pregnancy seems less marked, although our data is insufficient for conclusions.

The obese, flabby woman who habitually overeats and is careless of digestion seems more prone to toxemia than the average. In some of these mere bulk of body may be developed beyond parenchyma, so the added strain of pregnancy is ill borne. In cases of this kind reduction in weight by dietary restriction, exercise, and, at times, the judicious use of thyroid extract may serve to keep the woman on safe ground by bringing fat into a more normal ratio with active tissues.

In our present state of partial knowledge of the endocrines these

organs may by the carelessly minded be invoked to explain any clinical picture that can be drawn. Until the endocrinologist can replace fancies by facts in this field it is wise to preserve an attitude of tolerant inquiry. While it is probable that disturbances of internal secretion play a part in some of the toxemias of pregnancy, proof is in the future. In this connection it may be said that in the obstetric wards of a large urban hospital it would appear that an undue proportion of toxic patients are of what is rather vaguely called, the pituitary type,—large of frame, heavy of muscle and of feature, with spaced teeth, a masculine type of abdominal hair distribution and thick skin. It may be that the frequency of this type of woman among certain of the foreign elements in our population explains this seeming frequency in our toxic ward. The relation of toxemia to the endocrines is a matter upon which we need a new set of facts.

The influence of nervous or emotional strain upon toxemia is hard to estimate, yet in certain instances it appears quite definite. The lack of emotional equilibrium which a few women experience during pregnancy must and apparently does, through the vasomotor system, have an influence upon blood pressure. In such, a certain amount of education in the cultivation of an equal mind is of importance.

In variation in the emotional state, variation in endocrine balance, variation in conditions of local infections, we may imagine the explanation for the absence of toxemia in a given pregnancy and its presence in others antecedent or otherwise. Because the convulsion is the most dramatic symptom of toxemia, it has had great and, I believe, undue emphasis in the identification and management of this state. If we regard the convulsion as but one of many possible manifestations of a disturbed functional equilibrium accompanying certain badly borne pregnancies, we will be less likely to fail in recognition of mild or premonitory symptoms. To the pathologist the so-called eclamptic type of toxemia suggests a specific poison and the constant character of the lesions in liver and other parenchymatous organs is a logical argument in its favor. Proof is in the future. Certainly, extensive clinical study points out that the so-called eclampsia is but one among several varied types of the toxemias of pregnancy.

In the absence of satisfying evidence that toxemia of pregnancy is a unit condition due to a specific toxin, I believe we can do more for our patients by assuming the following position. Toxemia of pregnancy indicates that there is something basically wrong with the patient beyond the fact of pregnancy. In the absence of a demonstrable toxin, the greatest amount of information can be obtained from a study of the associated pathology. Also the greatest practical benefit to the mother and child can be had from such a study. This study is the province of the medical man. If complete medical survey were made in the case of every pregnant woman and particularly of every one showing

symptoms of toxemia, I believe light would be thrown upon this obscure condition by accumulated clinical study over a period of years and that much of practical therapeutic benefit would eventually result.

That there is a medical aspect of obstetrics as there is a medical aspect of urology or neurology or surgery or any other specialty has passed beyond the phase of argument into that of accepted fact. Only in the coordination of obstetric and medical services can the full light of modern medical knowledge be brought to bear upon the important problems touched upon. The time will come when the isolated obstetric hospital, or one without a staff organized for the study of the medical aspect of its patients, will be as archaic as the isolated surgical hospital. It has become increasingly apparent that obstetrician, internist and social worker are required for the proper solution of complex obstetric problems.

49 EAST FIFTY-THIRD STREET.

A CASE OF PERNICIOUS VOMITING OF PREGNANCY WITH LOW BLOOD CHLORIDES AND MARKED RESPONSE TO SODIUM CHLORIDE THERAPY

BY RUSSELL L. HADEN, M.D., AND DON CARLOS GUFFEY, M.D., KANSAS
CITY, KANSAS

(From The University of Kansas School of Medicine)

THE toxemias of pregnancy remain prominent among the unsolved problems of medicine. The etiologic factors are as yet undetermined. The incidence continues high. The mortality has been little influenced by the many varying methods of treatment. The rapid development in finer methods of blood chemical analysis has carried with it the hope in the mind of many that new light might thereby be thrown on eclampsia and the pernicious vomiting of pregnancy. This hope has, however, not been realized. The results of chemical studies so far reported have been most disappointing.

Plass¹ has recently summarized the literature concerning the nonprotein nitrogenous constituents of the blood in eclampsia and allied conditions and added data on other cases observed in the Johns Hopkins Hospital. He found that: "There are no characteristic changes in the concentration of nonprotein nitrogen, urea, and uric acid during the toxemias of pregnancy whether they are associated with convulsions or not. In many instances the serum or plasma findings are quite normal, while in other cases there is a moderate increase, which is more likely to affect the uric acid values so that a moderate rise in the concentration of this nitrogenous end-product is quite common but not invariable. Examination of the findings in cases of undoubted clinical nephritis fails to show any particular variation, which may be regarded as pathognomonic of the condition. It seems, therefore, that chemical examination of the blood for these constituents is quite useless as an index of the severity of the pathologic changes in eclampsia and its associated toxemias."

Most investigators in this field have limited their studies to the non-protein nitrogenous constituents of the blood. In the course of a chemical study of the toxemia of high intestinal obstruction Haden and Orr² have demonstrated a close relationship of the toxic body or bodies to the level of blood chlorides. It has been fully demonstrated that sodium chloride acts in some way as a protective measure in high intestinal obstruction and may be utilized as a therapeutic measure. The close chemical relationship of various toxemias due to different fundamental conditions suggested the possibility of some relation of the inorganic constituents of the blood to the toxemias incident to the pregnant state. The only reference we can find to the blood chlorides in pregnancy toxemias is made by Killian,³ who determined the chlorides in a few cases without significant results.

The following case of pernicious vomiting of pregnancy is reported since very striking changes in the level of the blood chlorides were observed and the chloride metabolism was evidently closely related to the nonprotein nitrogenous bodies of the blood. There was also a very marked response to sodium chloride therapy. Unfortunately no opportunity has presented itself for a further study of similar cases to determine whether such changes are in any way constant in this condition.

R. M., White, age twenty, case no. 13127, was admitted May 8, 1923, to Bell Memorial Hospital, University of Kansas on the service of Dr. Don Carlos Guffey, complaining of incessant vomiting.

Her personal history was unimportant. She had had one miscarriage at two months. During this pregnancy there had been no vomiting or other toxic manifestations. She stated that her last period had occurred January 23, three and a half months before admission to the hospital. One week after the beginning of the pregnancy she vomited and continued to do so daily. Various medical measures instituted at home had given no relief. She stated that she had been confined to bed most of the time. For two weeks she had a dull aching pain in the lower right abdomen. Her feet and ankles swelled on standing, but the swelling disappeared on going to bed.

On examination the patient was fairly well nourished. The general examination was negative. There was generalized abdominal tenderness, more marked in the right lower quadrant. There was no edema. The blood pressure was 120/90. pulse 120. The pelvic examination revealed an enlargement of the uterus, the size of a three months' pregnancy. The uterus was in normal position and the adnexa negative.

The blood count showed: red blood cells 4,672,000, white blood cells, 8,000, and hemoglobin 90 per cent. The basal metabolic rate was +20 per cent.

The urine on May 10, thirty-six hours after admission, showed a moderate amount of albumen, and numerous casts. The nonprotein nitrogen was 3 per cent and the chlorides (as sodium chloride) 0.09 per cent. The phenolsulphonephthalein excretion was only 10 per cent in two hours.

The significant findings in the blood chemical examination were a moderate increase in nonprotein nitrogen, urea nitrogen, and uric acid, a carbon dioxide combining power above normal, and a very low chloride content. A second examination the following morning showed practically the same findings. (Table I).

In view of the striking results obtained by the administration of sodium chloride in cases of intestinal obstruction with similar chemical findings, the patient was given sodium chloride as follows:

May 11	1500 c.c.	3	per cent sodium chloride, subcutaneously
May 12	500 c.c.	3	" " " "
May 13	400 c.c.	0.85	" " " "
May 13	1 gram		" " " "
May 14	1 gram		" " " "

A total of 65 grams of the salt was given in approximately 36 hours. The vomitus as recorded by the nurse, was as follows:

May 9	625 c.c.
May 10	850 c.c.
May 11	750 c.c.
May 12	400 c.c.
May 13	750 c.c.

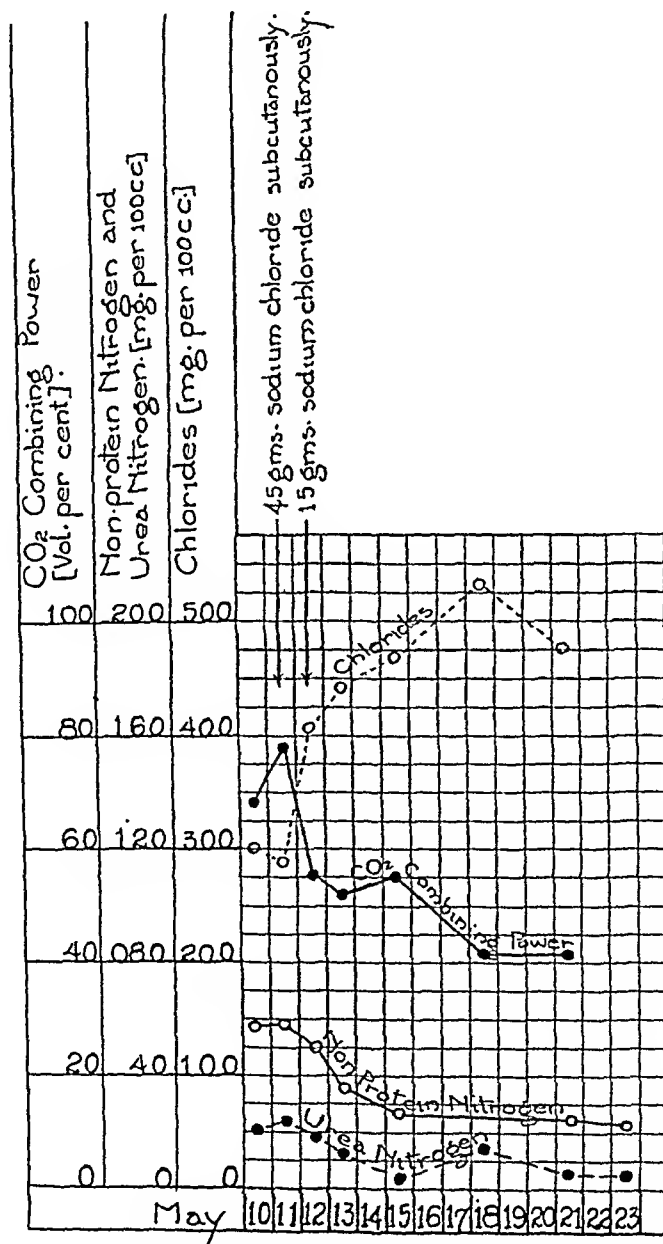


Chart 1.—Showing the chemical changes in the blood following administration of sodium chloride.

The blood chlorides on May 13, after the administration of the salt, were still slightly below normal (440 mg.). The blood urea nitrogen had fallen to 12.1 mg. per 100 c.c. and continued to drop. The chloride excretion in the urine was still very low, showing that the chloride given was taken up by the body tissues (Table 1).

The response to the sodium chloride therapy was most striking. The patient had no further vomiting or other toxic symptoms. The albuminuria and cylindruria disappeared. Ten days after admission to the hospital the phenolsulphonephthalein excretion was 33 per cent in 2 hours. The relation of the blood findings to the chloride therapy is shown in Chart 1.

The interne's progress note, made May 20, reads: "The patient has not vomited since receiving the sodium chloride. Feels well. Is eating normally, and walking around the ward."

The patient was discharged from the hospital May 24, 1923. Sodium chloride tablets were prescribed. She had no toxic symptoms at any time, but miscarried, a macerated fetus, three or four weeks after leaving the hospital.

DISCUSSION

The patient presented the picture of a serious intoxication. The therapeutic measures employed at home had not arrested the symptoms. She was brought to the hospital with the idea that it would be necessary to terminate the pregnancy. On admission she had an alkalosis as shown by the increased carbon dioxide combining power, an increase in non-protein nitrogen, urea nitrogen, and uric acid, and an extremely low blood chloride. The only treatment instituted was to supply sufficient sodium chloride to bring the chlorides to the normal level and maintain them there. This treatment was followed by an immediate cessation of toxic symptoms, a return of the chemical findings in blood and urine to normal, and a disappearance of the albuminuria and cylindruria. The phenolsulphonephthalein excretion rose from 10 per cent to 33 per cent in 10 days. It seems quite evident that the kidney changes were secondary to the general intoxication, and not the primary cause of the toxemia. The high nitrogen excretion and low level of blood creatinine lend further support to this idea.

The findings in this case suggest strongly that the toxemia from which this patient suffered had much in common with the toxemia of intestinal obstruction. It has been pointed out that several seemingly widely unrelated conditions may be chemically fundamentally the same. In intestinal obstruction the body chlorides are seemingly utilized as a protective measure against the toxic substances characteristic of the toxemia. Haden and Orr have suggested the possibility that the chloride is utilized as hydrochloric acid to convert the toxic body into a nontoxic one. After the depletion of blood chlorides below a certain level, there is a marked destruction of body protein giving rise to an increased excretion of nitrogen in the urine and a rise in the nonprotein nitrogenous bodies of the blood. According to this explanation the protein destruction is due to the direct action of the toxic body on tissue protein.

Other possible explanations for the origin of the toxemia after the depletion of the blood chlorides might be given. Thus, with the low

ehloride content in intestinal obstruction there is also a low sodium content.⁴ The increased protein destruction may possibly be due to accelerated autolysis following the withdrawal of sodium from combination with protein, which allows the tissue ferments to act as suggested by Bradley.⁵ According to this explanation the substances responsible for the toxic symptoms might arise from the abnormal destruction of body protein.

In this case the possibility must be considered that the low level of ehlorides was a result of a ehloride loss through the long continued vomiting. It has been abundantly proved, however, that such is not the case in intestinal obstruction. Instances of this specific type of intoxication have been observed in the entire absence of vomiting. The immediate cessation of vomiting in the instance here reported, with the restoration of the depleted ehlorides, shows that the vomiting is of toxic origin and was the result and not the cause of the underlying intoxication.

The fetus when miscarried after the patient left the hospital, was macerated. The question arises whether the death of the fetus could have been responsible for the improvement in the patient. The chemical findings were so characteristic of the type of intoxication which is relieved by the administration of sodium ehloride it is difficult to accept such an explanation.

It is apparent that no generalizations should be drawn from a single case. No opportunity has presented itself to study further similar cases from this standpoint. The findings at least suggest another angle from which such toxemias should be studied. Certainly other cases of a similar type will be observed in which sodium ehloride therapy will be indicated and of value.

SUMMARY

A chemical study of a severe case of vomiting of pregnancy is reported. The blood showed an increase in nonprotein nitrogen, urea nitrogen, uric acid, and carbon dioxide combining power and a very low ehloride content. The urine was high in nitrogen, low in ehlorides, and contained albumin and casts. The subcutaneous administration of sodium ehloride in large amounts was followed by an immediate cessation of toxic symptoms and a return of the blood and urine to normal. The findings suggest that some at least of the toxemias of pregnancy are similar to the toxemia of intestinal obstruction. In such cases sodium ehloride acts in a specific neutralizing, antitoxic, or protective capacity.

REFERENCES

- (1) Plass, E. D.: Jour. Am. Med. Assn., 82, 266, Jan. 26, 1924, lxxxii, 226.
- (2) Haden, R. L. and Orr, T. G.: Jour. Exper. Med., 1923, xxxvii, 365 and 377; *ibid.*, 1923, xxxviii, 55; Jour. Missouri Med. Assn., 1923, xx, 185, Surg. Gynec. and Obst., 1923, xxxvii, 465.
- (3) Killian, J. A., in *Toxemias of Pregnancy* by G. W. Kosmak, D. Appleton & Co., New York, 1922.
- (4) Haden, R. L., and Orr, T. G.: unpublished data.
- (5) Bradley, H. C.: Jour. Biol. Chem., 1922, lii, 467.

THE CURE OF INCONTINENCE OF URINE IN WOMEN*

BY C. JEFF MILLER, M.D., NEW ORLEANS, LA.

INCONTINENCE of urine in women is of very common occurrence, and in the majority of cases is directly due to injuries sustained during parturition, although the surprisingly large number of nulliparous women so affected proves that weak sphincteric function is responsible in a fair percentage of cases. It is especially the first group, the acquired type, which we shall emphasize in this discussion.

In spite of the frequency of the condition it is astonishing how many women forget to mention a partial loss of control unless they are questioned directly on this point. They seem to resign themselves to the annoying condition, and tend to magnify less disturbing symptoms.

The only attempt of which I am aware to determine the incidence of incontinence of urine in women was made by Taylor and Watt, who reviewed accurate records of 1006 gynecologic cases in the Roosevelt Hospital. They found control to be normal in 79.4 per cent of the cases, fair in 6.8 per cent, poor in 12.4 per cent, and lost in 2 per cent; roughly, therefore, in 15 per cent of these patients bladder control was so impaired that some degree of incontinence resulted. It was further shown that the percentage of partial or complete loss of control increased with the number of children the patient had borne. Control was poor or lost in 8 per cent of the patients with no children, in 14 per cent with from one to three children, and in 29 per cent with from seven to nine children. Concomitant pelvic lesions were also a factor, especially fibromyomata, and 45 per cent of the prolapse cases were affected. Taylor's findings will be practically confirmed by anyone who reviews a sufficiently large series of gynecologic cases.

Many ingenious explanations of this affection have been offered, and many different procedures have been suggested for its cure. It is commonly believed to be associated only with marked forms of displacement and cystocele, but this is by no means correct. Indeed, in many of the severest cases a superficial examination while the patient is passive will reveal the pelvic relations apparently normal. But if she is examined again while she is straining or coughing, and then again while she is standing, a typical cystocele is promptly revealed, with a characteristic upward pointing of the meatus, and a revolving of the urethra around the pubes, until its direction is dia-

*Read at the meeting of the Southern Surgical Society, White Sulphur Springs, December 11 to 13, 1924.

metrically opposite its normal downward and forward direction. Just when this rotation of the urethra is greatest, urine will be lost, proving that the loss of control occurs with the sudden rotation and displacement of the urethra and vesical neck, which in turn is due, in parous women at least, to injury of the anterior vaginal fascia, especially about the vesical neck.

Acquired incontinence is seldom due to actual injuries of the vesical sphincter itself; if it were possible to dissect it out, it would be found that it is rarely, if ever, seriously injured. Moreover, the ease with which so many cases can be completely relieved by a proper plastic operation proves that practically always the pathology is due, as has been pointed out, to injuries of the fascial sheet intervening between the bladder and vagina. Taylor believes that incontinence not due to the vesical sphincter is caused by displacement of the vesical neck and urethra, usually associated with prolapse of the anterior vaginal wall and the base of the bladder. This prolapse does not involve the entire circumference of the urethra, but only the inferior part, causing a traction and sagging which tends to hold open the sphincter and interfere with normal control. This readily explains also why as a rule severe cases of urethral prolapse associated with extensive prolapsus uteri do not suffer from incontinence; when the entire urethra sags, the traction on the sphincter is removed.

Victor Bonney, who holds practically the same view as Taylor, gives a slightly different explanation of the supporting mechanism of the female bladder and urethra. The structure usually described as the pubocervical fascia he describes as a sheet composed entirely of unstriated muscle fibers running anteroposteriorly. This pubocervical muscle sheet, as he calls it, extends from the back of the symphysis pubis to the cervix at its junction with the vaginal wall, while laterally it blends with and unites across the middle line the innermost fibers of Mackenrodt's ligament on either side. It is perforated in front by the urethra, and its lower surface in front of the point of perforation blends with a solid block of tissue in which runs the urethra, imbedded, as it were, in the block. This block of tissue, which contains many unstriated muscle fibers, is wedge-shaped, and may be called the "periurethral wedge." It is lightly attached to the subpubic angle and the rami of the pubes and the edges of the levatores ani.

Laxity of the front part of the pubocervical muscle sheet allows the bladder to slide down behind the symphysis pubis, and the periurethral wedge and the urethra to carry downward and forwards by wheeling around the subpubic angle. It may yield under the trauma of parturition immediately behind the symphysis pubis, allowing the neck of the bladder and the urethra to slide down behind and around the symphysis. If it yields in the middle, the sheet drops like a hammock, forming the ordinary cystocele. If it yields near the cervical

junction, there is a prolapse of the anterior vaginal vault. Injury of the front part of the muscle sheet immediately behind the symphysis is the cause of incontinence; laxity of the other portions of the sustentacular apparatus of the bladder not only does not increase the incontinence, but may actually prevent it. He agrees with Taylor that this explains why incontinence does not occur in cases of prolapse of the vagina, but rather the reverse, or in severe cystocele, when the urethral attachments have not been disturbed.

I have quoted Bonney at some length because his explanation shows so clearly that the vesical sphincter is not the only factor in bladder control, but rather that this control is secured by a proper coordination of the sphincter with the puboervical muscle sheet which we have described. Incontinence of urine in women who have not had children, while often due to weakness of the sphincter, may also be due to a deficient fascia; in many instances such patients will show a shallow perineum, and a distinct bulging of the anterior vaginal wall on straining.

A casual review of the procedures suggested at various times for the cure of this annoying condition shows that for a long time there was no definite conception of the true mechanism of bladder control. Among the earlier operations perhaps the most popular was that suggested by Pawlik, to reduplicate and fold in the urethra along its entire course. Gersuny was a strong advocate of dissecting out the urethra and twisting it, so as to narrow the canal; this is a very radical procedure, and there are few instances in the literature of cases treated by this method. Later came Dudley's suggestion of transplanting the urethra upward near the clitoris by an ingenious plastic operation, which causes the urethra to have a sharp angle around the symphysis.

These procedures were often of temporary benefit, but no one of them was entirely satisfactory. Moreover, they were all based upon the idea of an injury to the sphincter; and all efforts were apparently aimed at suturing or narrowing the sphincteric fibers, although, as we have shown, the sphincter was seldom at fault, and the real pathology lay elsewhere. Then came the operation suggested by Howard Kelly, which was aimed primarily at catching the torn or overstretched fibers of the sphincter and strengthening the anterior vaginal fascia. A careful study of the technic will show, however, that not only is the urethra reconstructed, but its natural supports are also fixed, and this support is the wedge-shaped fascia described by Bonney.

Of late years it has been my practice to combine Kelly's technic with the anterior colpoplasty described by John Clark. In many instances in my work the careful restoration of the fascia about the vesical neck, without any attempt to narrow the sphincter, has been

eminently successful, which has convinced me more than ever that the fascia is largely at fault, and that proper support is all that is necessary. The U-shaped suture used by Clark gives the best immediate and permanent support of the urethra and vesical neck that has yet been devised, and since its adoption I have not considered it necessary to narrow the posterior part of the urethra as often as formerly. Practically all of these cases require also a careful readjustment of the entire vaginal sheet, as is done in the ordinary cystocele operation.

It is well to emphasize, in addition to surgical measures, the value of the pessary in incontinence, particularly when it occurs in patients who are not safe surgical risks, or who decline operation. Supporting the sagging, weakened fascia by this mechanical means will frequently relieve the milder types of incontinence, and occasionally even the severer forms also. The simple Hodge or Smith pessary, or more especially the ring pessary, which is very easily adjusted, has in my hands yielded as good results as the Gehrung pessary, or other types difficult to apply.

REFERENCES

- (1) *Taylor, Howard C., and Watt, Charles H.*: Surg. Gynec. and Obst., March, 1917, pp. 296-99. (2) *Bonney, Victor*: Jour. Obst. and Gynec. Brit. Emp.—Autumn, 1923, pp. 258-65.

512 HIBERNIA BUILDING.

TWO-WAY TREATMENT CATHETER*

BY WILLIAM H. CARY, M.D., BROOKLYN, N. Y.

THIS two-way treatment catheter facilitates the diagnosis and treatment of bladder disturbances. Made of silver, it is unbreakable, and will not fall from the urethra when supported by the hand. When introduced, it accomplishes the purpose of a catheter and, without removal or reintroduction, offers opportunity for bladder treatment, with a saving of time to the operator and a minimum of discomfort to the patient.

This catheter embodies the two-way principle of the Dickinson catheter which has the disadvantage of being glass. The gentle curve (Furniss) makes it self-retaining if the hand must be withdrawn. The new and special feature, however, is the tip of the upper half of the "Y," to which the rubber nipple is attached. When the rubber nipple is removed, a Luer syringe may be perfectly adjusted, or a quarter-inch rubber tubing snugly fitted to the tip. When fitted with the rubber bulb it is a combination catheter-and-pipette. Medication

*Presented to the New York Obstetrical Society, January 24, 1924.

may be sucked into the upper pipette portion before the catheter is introduced. When the catheterization is completed, that is, the bladder emptied, the medication is expelled by the rubber bulb into the bladder. This method of instillation is applicable only when the urine is not wanted for study, as the specimen is always contaminated with discoloring medication. When, however, the catheterized specimen is desired in sterile form for microscopic study, guinea pig injection or culture growth, the catheter is used as any silver catheter. When the sterile urine specimen is obtained, the rubber nipple is removed and a Luer syringe containing a definite amount of argyrol, mereurochrome or other desired medicine, is fitted into the upper branch of the

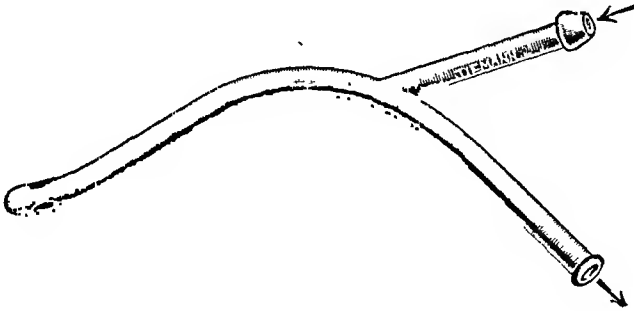


Fig. 1.

catheter and the instillation thus made. This quick method of obtaining a diagnostic specimen and treating the bladder without soiling the hands, linen, etc., with discoloring solution will give one much satisfaction.

When the catheter is to be used for irrigation purposes, a quarter-inch rubber tubing (with a glass section for observation, if desired) may be slipped over the knob of the upper branch and irrigation effectively carried out. The illustration (Fig. 1) shows the catheter without the rubber bulb. For ordinary purposes it should be equipped with the rubber bulb, otherwise a divided stream may be obtained when the catheter is passed. The rubber nipple is readily removed for other treatment as above outlined.

36 PIERREPONT STREET.

AN UNUSUAL EXAMPLE OF EXSTROPHY OF THE BLADDER WITH MARKED SEPARATION OF THE PUBIC BONES

By E. C. SAGE, M.D., OMAHA, NEBR.

(From the Department of Obstetrics, University of Nebraska College of Medicine.)

THIS case report of exstrophy of the bladder and marked separation of the pubic bones is offered on the score of the rarity and interest it may afford.

Quoting from the excellent article of Drs. E. H. Hutchins and A. F. Hutchins in the June, 1923, number of *Surgery, Gynecology and Obstetrics*, this abnormality occurs only once in 50,000 persons according to Nendoerfer¹ and also Marion², who further states that nine-tenths of the patients die in infancy or a little later. Spooner³ found it four times in 116,500 birth records. The ratio in which it occurs in boys and girls is about eight to one. Orlow⁴ states that of 74 children born with exstrophy of the bladder, only 23 passed the twentieth year of life, the others dying of pyelonephritis and other kidney complications.

Scholl⁵ states that in 367,000 patients at the Mayo Clinic, there were 69 with exstrophy of the bladder (one in 5318), and in three of these, the condition was malignant. Quoting from his article in the *Annals of Surgery*, March, 1922, on the potential malignancy in exstrophy of the bladder, "All exstrophied bladders show results of irritation and trauma. The exposure to the air, the constant irritation of the clothing, the frequent trauma and persistent infection are all causes for the possible need for a protective mucous covering or mucous secretion, and furnish an excellent stimulation to cellular hyperplasia." He gives brief case histories of nine exstrophied bladders, two in women. In two of his nine cases, definite malignant changes had taken place. He states that "the incidence of malignancy in exstrophy of the bladder is relatively high in reported cases, as compared to the incidence of malignancy in normal bladders. This relative frequency of malignancy, suggests that exstrophied bladders should be removed as early as possible in all operable cases."

The striking feature about these tumors is that they were all adenocarcinomatous. This is in marked contrast to the types of tumors occurring in normally situated bladders, as adenocarcinomas make up only about 2 per cent of such growths.

Macewen⁶ in the *Lancet*, March 18, 1922, reports the case of a girl, 17 years old, who had been operated three times, still had an extroversion of the bladder, with separation of the bones at the symphysis pubis of "nearly an inch." The bladder and ureters were transplanted into the pelvic colon. The patient made a rapid and satisfactory recovery and is able to retain urine for four hours at a stretch.

Winslow⁷ reported a case of a woman who had four children, and Moorehead⁸ reported a case who had borne two children.

The case I wish to report has had one full-term child borne by cesarean section nine years before admission to the University Hospital, and this is one of the features to which I wish to call attention when the reader examines the illustration of the marked separation

of the pubic bones in this case, fully five inches of gap between the ends of the pubic bones. (See x-ray picture.) (Figure 1.)

Mrs. J. K., 12433, age thirty-four, white, divorced. Admitted 11-30-23, dismissed 12-14-23. Complaint: Pain in region of labia and rectum. Sore on labia and at anal opening. Patient was raped by employer on Oct. 20, and on Nov. 18, developed an itching around the labia. Pain in this region began the next day. Vesicles developed about two days later. Ulcerated areas followed. Patient attempted to cure these sores by use of zinc ointment. No results, so came into the University Hospital, Nov. 30, 1923.

Past History: Patient has had incontinence of urine all her life, due to exstrophy of bladder. Has had gonorrhea several times. Periods started at 14 years of age, every 28 days, amount of flow variable. Last period two weeks ago. Flowed

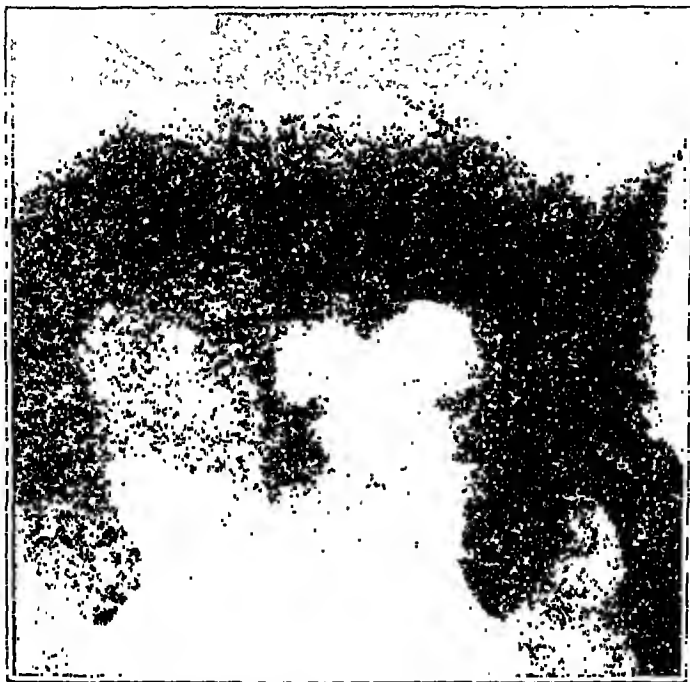


Fig. 1.—Marked diastasis of the pubic bones. Five inches of separation. Patient had a cesarean section nevertheless.

for three days. Patient had one child nine years ago by cesarean section. No miscarriages. Patient was operated in 1918 for exstrophy of bladder, but results were *nil*. An extraperitoneal immobilization of the bladder with closure of anterior wall of bladder by plastic flaps, was done, but with negative results. Patient was advised to have ureters transplanted into rectum, but she would not submit to this procedure.

Patient apparently not in pain. Very talkative. Tympanitic abdomen. Large scar in midline from umbilicus to region where symphysis should be, where the bladder mucosa protrudes, the symphysis having failed to unite (Fig. 1). There is intermittent drainage of urine from this open bladder, which is quite sensitive. Just below this red raw surface of the everted bladder mucosa 8 cm. in diameter, is the normal vaginal opening, except for a sharply outlined indurated ulcer about the size of a dime, located on the posterior vaginal wall. A similar ulcer is located at the anal opening, on the anterior surface of the anal wall. These ulcerated areas are probably initial syphilitic lesions. (Fig. 2.)

Blood Wassermann, twice negative, and once 2-plus.

Blood count, 85 per cent Hb, 3,800,000 RBC, WBC, 9,200.

Dark-field examination of the serum from the ulcerated areas in vaginal and rectal openings, negative on Dec. 3 and Dec. 7, 1923. Lesions considered syphilitic. Patient was immediately started on antiluetic treatment.

This patient had become so accustomed to her urinary incontinence that she did

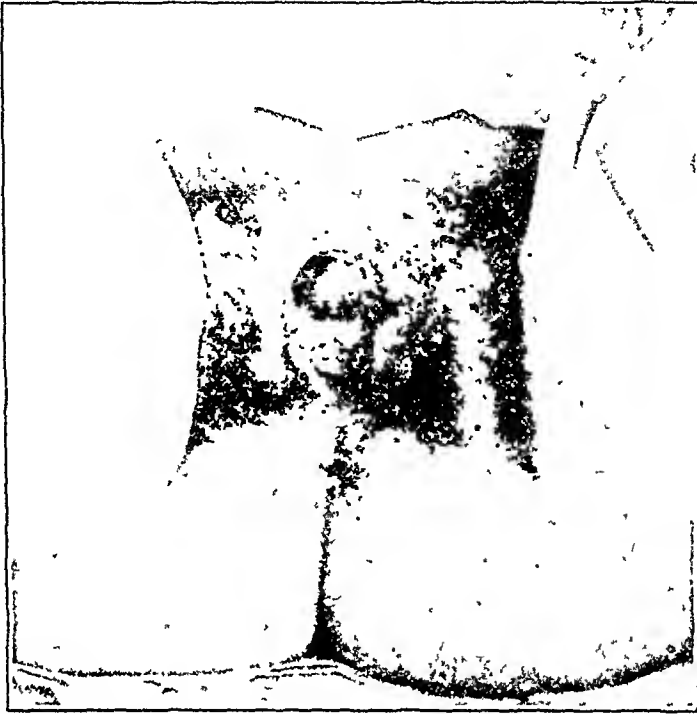


Fig. 2.—Suprapubic scar of cesarean section. Extrophy of bladder. Separation of clitoris. Patient had a chancre at vulvar orifice and anal opening.

not care to undergo any further surgical intervention for the relief of the same, but entered the hospital this last time for the treatment of the venereal disease she had contracted.

SUMMARY

The unusual features in this particular case were:

1. The marked diastasis of the symphysis pubis, (fully five inches), so that there certainly was sufficient room for the fetal head to pass through the birth canal; yet the patient had been subjected to a cesarean section.
2. The ability of this patient to walk comfortably with a wabbling gait and her indifference to such a distressing abnormality, refusing to allow any further attempt of curative operative measures to be instituted.
3. That regardless of such a deformity, she was quite promiscuous as to her sexual relations, as evidenced by her former Neisserian infection, and the contraction of her present luetic manifestations; a chancre at the introitus of the vagina and another primary lesion at the anal opening.

REFERENCES

- (1) *Neudoerfer*: (quoted by Berger), Jour. Urol. Cutan. Rev., 1916, xx, 376. (2) *Marion, G.*: Histoire d'une exstrophie vesicale chez une femme, Presse méd., 1910, xviii, 145-148 (Quoted from Scholl). (3) *Spooner*: Boston Med. and Surg. Jour., 1905, lii, 456. (Quoted from Hutchins and Hutchins). (4) *Orlow*: Rev. de gynéc., et de chir. Abdom., Par., 1903, vii, 795. (Quoted from Hutchins and Hutchins.) (5) *Scholl, A. J.*: Annals of Surg., March, 1922, p. 365. (6) *John, A. C.*: Macewen in the Lancet, March 18, 1922, p. 531. (7) *Winslow, R.*: Surg. Gynec. and Obst., 1916, xxii, 350-352. (8) *Moorehead*: Surg. Clin., Chicago, 1918, ii, 1005.

520 BANKERS RESERVE LIFE BUILDING.

A CASE OF PREGNANCY IN DOUBLE UTERUS TERMINATED BY HYSTEROTOMY

By WALTER PARRY GUY, M.D., LOS ANGELES, CALIF.

MRS M., aged thirty years gave a history of having been born with an imperforate anus for which some sort of emergency operation had been done shortly after birth. She was operated upon again in 1904, at which time there was found an enormous dilatation of the colon with a mass of fecal material in the descending colon as large as an adult's head. According to the report of the surgeon; "The dilatation was enormous and extended around to the cecum. By a stage operation, resection of this portion of the bowel was made."

Her family history was negative, father dying at the age of sixty-four of blood poisoning, her mother living but with heart disease, and five sisters and one brother all in good health.

She has had no serious illness and except that she must watch her bowels carefully, is in perfect health.

She menstruated first at fifteen and has been regular with little or no pain.

The patient was seen first a few months before her marriage, at which time she requested a complete examination and an opinion as to the advisability of marriage. This examination showed a well-developed young woman who looked younger than her age. She was sixty-one inches tall and weighed 109 pounds, skin clear, rather well formed, slight enlargement of the thyroid, breasts small, tissue good, nipples small but good, abdomen shows a long scar with signs of drainage extending from the ensiform to the pubes with the umbilicus removed. The perineal region showed considerable scar tissue around the anus which had apparently neither external nor internal sphincter but a constriction of scar tissue about two inches up which would not permit the tip of the little finger. The external genitalia were normal and well developed. The vagina was short but ample. In the upper part of the vagina there was a septum about an inch and a half long which divided it into two nearly equal parts. There were two os uteri, the left being larger and better developed. The uterus was infantile in type the cervix being greatly elongated and the fundus small. At this examination there was made out a small nodule about the size of a filbert on the right side of the fundus which was at first thought to be a fibroid but later diagnosed as the right fundus of a double uterus. There was no enlargement of either ovaries or tubes. The pelvis felt small and rather irregularly flat. The extremities were normal.

She was advised as to her condition and doubt expressed in regard to her ability to conceive, and if conception were possible of the difficulty of carrying to term and of delivery.

However, she returned in January, six months later, with a history of having menstruated last on November 25th. She was examined several days later under an anesthetic to get a better idea of her condition and to make a prognosis. The

findings were practically as I related except for an early pregnancy in the left side of the uterus. It was decided at this time, on account of the greatly elongated cervix, that any interruption of the pregnancy except by abdominal section was out of the question and that she should be allowed to continue her pregnancy to term or as long as possible.

Her pregnancy was practically uneventful except that she had some difficulty in keeping her bowels acting regularly. A preparation of agar-agar and mineral oil acted quite satisfactorily and she went into labor August 15. This was about two weeks before her estimated time. The membranes ruptured at 8:00 P. M. but with no pains until several hours later. No internal examinations were made, either vaginal or rectal, the latter being impossible on account of the rectal stricture, so that the amount of dilatation was not determined. The baby lay in the S. R. A. position well above the inlet, the fetal heart tones were good and the condition of the mother excellent. On account of the flat pelvis, the rigid perineum with ex-

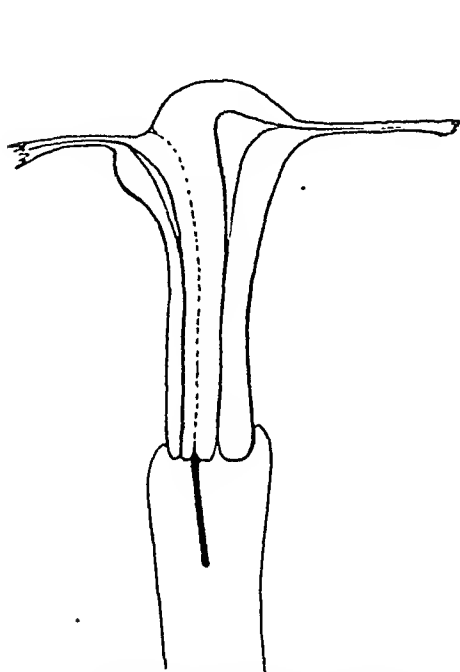


Fig. 1.—Diagrammatic impression of uterus at first examination.

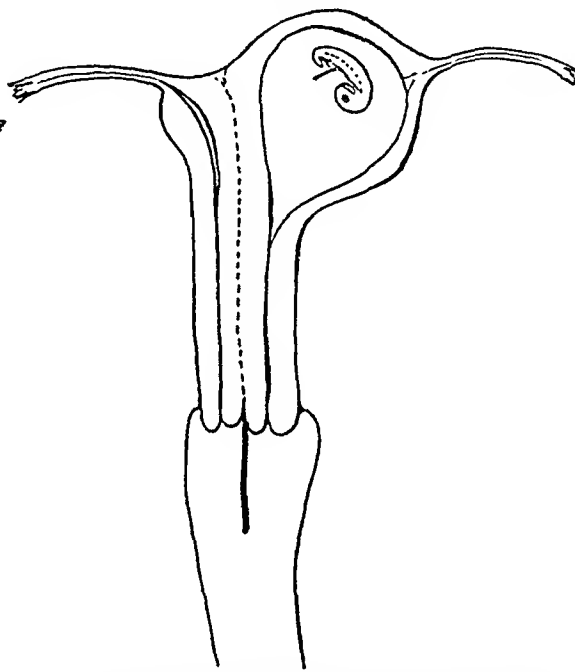


Fig. 2.—Diagrammatic impression of uterus at second examination, six weeks' pregnant.

cessive scar tissue around the anus, the rectal stricture, abnormally long cervix, infantile type uterus, position of the baby, premature rupture of the membranes, etc., it seemed advisable to do a cesarean section. She was delivered of a seven pound girl baby perfectly normal in all respects.

After delivery examination of the uterus at first glance seemed to refute a diagnosis of double uterus, but closer examination showed a flattened band of tissue, lighter in color, running from the right tube to the cervix. This was about three centimeters wide and one centimeter thick. It was sharply defined from the congested uterus by its paleness and was without doubt the right side of a double uterus which had become almost stretched out of recognition.

The puerperium was entirely uneventful and the patient left the hospital on her tenth day.

She was examined two months later at which time the uteri still had a disproportionally long cervix but a rounder and more normally shaped fundus. The smaller lump on the right side of the uterus was still palpable. Two probes inserted into the two os uteri did not come in contact. The baby is an exceptionally fine specimen and the mother is in excellent health.

Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY

FORTY-NINTH ANNUAL MEETING

HOT SPRINGS, VA., MAY 15, 16 and 17, 1924

DR. CURTIS F. BURNAM, Baltimore, Md., presented a **Report of Some Observations of the Effects of Radium Therapy in Cases of Large Uterine Fibroids.** (For original article see page 411.)

DISCUSSION

DR. GEORGE GRAY WARD, NEW YORK CITY.—When I received notice from the Secretary that I was to take part in this discussion I was interested in having our records at the Woman's Hospital looked up to see the number of cases that we could classify as large fibroids that we had treated with radium. I think we all generally agree that symmetrically shaped fibroids the size of a three or four months' pregnancy may be easily treated by radium. Fibroids larger than a four months' pregnancy are the ones that I have considered would come within the scope of Dr. Burnam's paper.

In looking over our records from May 5, 1919, when we started to use radium, to June 1, 1923, I found we had radiated 17 such cases that were over a four months' pregnancy size. Of these we have 14 satisfactory follow-ups. Of these fourteen, eleven have given satisfactory results with the use of radium, practically all of them being materially reduced in size—nearly to normal. As Dr. Burnam says, the uterus may be a little larger than normal, but it was an entirely satisfactory result as to reduction in size. There was one case that we classified as partially satisfactory; it was reduced from two fingers above the umbilicus down to the size of a four months' pregnancy. In one case there was a flat failure, no reduction in size of the uterus; and in one case we did a hysterectomy a couple of months after we radiated, because of pressure symptoms that had not been relieved, although, of course, two months is a very short time to expect to get full result of the radium.

The dosage that we used varied from 1200 to 3600 milligram hours. The technique we use is intrauterine and we employ the radium in tandem formation. Two cases developed toxic absorption due to the fact that there was an intrauterine slough. They were cases which proved to have a submucous growth and a considerable slough occurred which was followed by temperature; the sloughs were finally expelled and the patients were entirely relieved, although one case was 79 days in the hospital and the other 30 days on account of this sloughing mass. After about six months as a rule, you begin to get an appreciable change in size.

The contraindications to our performing an operation in these cases were cerebrospinal disease, spastic paralysis, 7 cases with pronounced cardiac lesions, 1 case with a most pronounced anemia. Excessive adiposity was another reason why we did not operate in some cases. Other contraindications were hypertension, urinary system infection, psychoneurosis, chronic bronchitis. One case had

great difficulty in taking anesthesia, and as we could not determine the cause we were afraid to go on with it.

I think Dr. Burnam in his preliminary summary of his paper in the program stated that the radium affected the uterus and the ovaries as well. It is always a question in my mind as to how much the ovaries are affected by the radium as they are so far beyond the range of the radium in these large growths. I wonder whether the effect on the endometrium has not something to do with the function of the ovaries insofar as the endometrium is supposed to have possibly an endocrine function, as pointed out by Dr. Norris. Possibly that may affect the ovaries in some way. The one case that we operated on after radiation was very carefully examined and no change could be made out in the ovaries.

DR. HAROLD C. BAILEY, NEW YORK.—I am afraid that I shall have to bring a discordant note into this discussion. Among my cases of large fibroids I find there are but nine tumors in the entire group and that only five of these extended above the umbilicus. As far as possible we have confined ourselves to the treatment of the interstitial fibroid the size of a three months' pregnancy. These smaller fibroids disappear sometimes completely, but with the larger tumors I have never had the same success.

Of the fibroids above the umbilicus, there were five cases; one was lost in the follow-up, I think she had a hysterectomy in another hospital; on the remaining four we did hysterectomies. None of these fibroids receded below the umbilicus, although three were somewhat reduced in size. On removal one was very edematous and, as a matter of fact, larger than when we first treated it. One was a good deal smaller, but it was filled with areas of degeneration and was undoubtedly going through a marked change.

It seems to me that another important point brought out by both Dr. Burnam and Dr. Ward, is that these tumors recede owing to several actions of the radium. The follicular apparatus has to be destroyed if there is to be any reduction in the size of the tumor. The mucosa after irradiation also gradually atrophies, and no longer responds to the stimulation of the ovary. Finally, endarteritis leads to occlusion of many of the smaller vessels and a reduction in the nutriment ensues. Therefore, these tumors should have treatment from within the uterus, and the large fibroids should have in addition radiation from without, either by radium or x-ray.

The selection of fibroids suitable for treatment has been outlined by Dr. John G. Clark and others, and treatment of larger fibroids will lead to unsatisfactory conclusions from the standpoint of both the patient and the doctor. The bleeding is stopped, but we must wait for artificial senility on the part of the uterus in order to have it diminished in size.

DR. R. M. RAWLS, NEW YORK.—One of the cases in Dr. Ward's series with obesity and high blood pressure, was a patient of mine, thirty-six years of age who weighed 227 pounds and had a systolic pressure of 180, diastolic of 100. Her principal symptom was bleeding and pressure symptoms; 100 mgs. of radium was introduced for twenty-four hours and for three successive menstrual periods the menstruation continued and there did not seem to be any appreciable decrease in the fibroid, which reached three fingers above the umbilicus. There was likewise a pedunculated fibroid about the size of a tangerine orange, coming off the internal os. At the end of six months there had been a marked decrease in the size of the tumor masses. This case has been followed almost three years, and although she weighs 227 pounds and still has a high blood pressure she is in good health, and the uterus the size of a nulliparous uterus, with no palpable masses.

DR. JOHN OSBORN POLAK, BROOKLYN, N. Y.—I should like to ask Dr. Burnam what difference he has observed in the effect of radium on large tumors in women who are below forty and those who are over forty. I would also like to ask him whether he can suggest any way to determine the exact relation that the fibroid bears to the uterus without complete surgical anesthesia, because it is, in our experience, the case that is an extremely bad cardiac or renal risk, or in extremely fat or anemic risks, with the large tumor, that we need to use radium. Personally, we have felt that only by the most careful examination under an anesthetic can we determine the relations of a tumor.

Our own experience has been limited to five large tumors, with three successes. Two have had to be subsequently hysterectomized, and in both of these tumors we misjudged their relations to the uterus. In each we found extensive edema and considerable degenerative change. One of these patients died of a virulent streptococcal infection, in which the coccus was demonstrated in the center of the tumor as well as in the blood.

DR. JOHN G. CLARK, PHILADELPHIA, PA.—I would call special attention to one class of tumors which we particularly feel should not be subjected to irradiation. This is the myomatous tumor with an associated anemia out of proportion to the actual loss of blood. The patient presents that curious lemon-yellow tint of skin so frequently characteristic of the cachexia of malignancy, and in addition complains of pain on pressure over the tumor. The latter sign is of great diagnostic value. Such tumors are usually in the early stages of necrosis, presenting on bisection a dusky slate-like or grayish-red appearance. In such cases we ascribe the cachectic appearance to a blood dyscrasia incident to toxic absorption. We fear irradiation will further add to the necrosis with its coincident dangers, and therefore strongly advocate an operation in preference. In the shrinkage of an ordinary myoma after irradiation, I fully concur with Dr. Burnam in his assertion that there is no toxic absorption of deleterious effect, but in the above class of cases I take a contrary view. As I see these cases, no painful myoma should be irradiated for fear that it is of this early necrotic type. With positive contraindications to surgical intervention any large myoma associated with hemorrhage may be irradiated, otherwise we limit its application to the smaller tumors with hemorrhage as the cardinal indication. In my department at the University Hospital we see no reason to change our viewpoint, based upon the observation of more than a thousand cases, that unless there are positive surgical contraindications, surgery serves a better purpose than radium in our therapeutic armamentarium.

DR. GEORGE GELLHORN, ST. LOUIS, MO.—I have long been convinced, as has Dr. Burnam, that the action of radium on fibroids is twofold. The influence by way of ovaries is essentially an age involution and this necessarily takes quite a long time. In the greater number of cases, however, there is a rather rapid diminution of the size of the tumor after radiation, and not infrequently, the menstruation will persist for one or two, in one of my cases for four months, yet the tumor continues to decrease. This can only mean a direct effect of the radium upon the tumor though I cannot give a satisfactory explanation.

I am using radium quite extensively, even in large tumors which formerly I attacked surgically, and I obtain very satisfactory results with intrauterine applications, using a screen of brass, lead, and rubber and applying the radium, on an average, for 1800 milligram hours.

A word of caution may not be amiss lest others have the same unpleasant experience I have had. In three of my cases the intrauterine applicator slipped down into the cervical canal; there resulted later a stenosis or stricture at this

place, which in turn led to the formation of a troublesome pyometra. For this reason the uterine cavity should be thoroughly packed to prevent any changes in position on the part of the applicator.

Intrauterine application may not be feasible in every case. I wish to put on record an observation, unique as far as I know the literature, in which radiation of a distant part of the body resulted in diminution of a uterine fibroid. This was a case of a very large cervical fibroid, combined with even larger multiple subserous fibroids extending to the umbilicus. I might have radiated the fibroids of the uterine body, but the cervical fibroid was in the way, and moreover, cervical fibroids are refractory to radium or x-ray. The condition, therefore, called for operation, but there was also a toxic goiter present which made operation impossible. I had this goiter x-rayed with the hope of thereby rendering the case operable, and found very much to my surprise that, within four weeks, the tumor had receded from one centimeter above the umbilicus to three fingers' width below the umbilicus. This would have been utterly inexplicable to me had it not been that just at that time—exactly a year ago—there was quite a discussion in the German Gynecologic Society at Heidelberg as to the effect of radiation of the hypophysis on the genital organs. A number of instances were reported where uterine fibroids had decreased or altogether disappeared after radiation of the pituitary gland. My own case seems to indicate that fibroids may be affected by radiation almost anywhere in the chain of endocrine glands.

DR. HIRAM N. VINEBERG, NEW YORK CITY.—I should like to ask how long after the treatment with radium can you have toxic symptoms develop. I had a case where there were no toxic symptoms at the time of treatment, but five or six weeks afterward patient developed anorexia, nausea and a feeling of faintness. Would these symptoms likely be due to the radium application six weeks before?

DR. CAREY CULBERTSON, CHICAGO, ILL.—I should like to ask Dr. Burnam, as his paper is limited to radium treatment of large fibroid masses, which are usually multiple and usually occur in older women, but occasionally are seen in younger women and occasionally are not multiple,—how does he distinguish in the younger women between the cases to be treated by radium and those to be treated by myomectomy? Radium is curative but it is also destructive, and while pregnancies have taken place after radiation, this is not always to be expected. The point I want to make is this: that there is a conservative surgical treatment which is less destructive to function than is radium and x-ray. How does he distinguish in the younger women, how does he classify his cases, as to whether they should be operated upon conservatively or radiated?

DR. BURNAM (closing).—I have not presumed to classify and suggest methods of treatment at all. I simply gave our own experience as to what might be done in this way and to offer it as an activator to the Society, each man thinking his own case out and carrying his own work out. I do not feel that we are in a position to lay down fixed rules at the present time.

We have not radiated many large fibroids in young women, but the fibroids have apparently reduced quite as satisfactorily in the young as in the older women. As a general rule, it seems to me that the nervous upsets, the menopausal disturbances have been less in the younger than in the women near the menopause.

The cases that Dr. Clark speaks about we have also observed and I have been inclined to put most of those in the operative group of cases. The mere fact of distress has made us feel that there was something additional to the fibroid, and I think some of those cases are perhaps due to the patient's general condition. Certain patients have very weak bone marrow and the bleeding brings them to a

very bad situation. I would think that might account for some of the cachexia and anemia rather than any condition of the fibroid itself. I would feel that in that case you probably had some complication, that there was some infection which had been established rather than any absorption of toxic material.

Dr. Ward made me think of another thing. We use an applicator about 2½ inches long and we hardly ever feel it safe to give in one spot more than 1500 mc. hours. If we have an enormously long cavity it can be extended and we can radiate in several places. In our early cases sloughs occurred. As far as I can see, the external radiations, provided they are well applied, will make these fibroids go down quite as satisfactorily as the internal applications. I do not believe, however, it is as satisfactory a method on the whole because it does not control bleeding as quickly.

I am familiar with the work of radiation of the hypophysis and I think it probably has an indirect effect on the ovary. Dr. Hofbauer is in Baltimore now and has been talking to me about radiating the mid-brain and hypophysis for certain conditions. He says a small dose to the mid-brain and hypophysis—a stimulating dose, he calls it—will remove hot flushing, motor instability and all the conditions that we associate with the menopause.

DR. EMIL NOVAK and DR. KARL H. MARTZLOFF (by invitation), Baltimore, Md., presented a paper entitled **Hyperplasia of the Endometrium—A Clinical and Pathological Study**. (For original article see page 385.)

DISCUSSION

DR. CHARLES C. NORRIS, PHILADELPHIA.—There is no sharply drawn line between the histologic appearance of normal pre-menstrual endometrium and some of the lesser grades of hyperplasia, although in well marked specimens the latter is characteristic. As the essayists have stated, the mucosa may be thinner than the normal; in most specimens the endometrium is thickened and may be polypoid and macroscopically almost suggestive of a new growth; indeed Mengé has given the name benign adenoma to this condition. This, however, is misleading as the lesion is not in any sense a neoplasm.

Whether or not hyperplasia is a clinical entity is undetermined. No active inflammatory change is present and the correctness of the old theory of an inflammatory constriction causing dilatation of the glands is unproven. The presence of plasma cells or other evidence of infection is nearly always lacking. I believe that hyperplasia is probably the result of malfunction of the ovaries and this is borne out by its greater frequency at about the menopausal age. Hyperplasia is frequently associated with menorrhagia. I have, however, observed cases long after the menopause and have also seen the characteristic histologic changes present in women who have never had any excessive bleeding. I am therefore inclined to attribute the bleeding to ovarian disturbances and to view the hyperplasia as an incident. This opinion is strengthened by the histologic appearance of specimens of hyperplasia, as nothing is observed which would suggest bleeding from the endometrium *per se*.

Menorrhagia in association with hyperplasia is infrequent and during the cancer age should always be viewed with suspicion, especially if the bleeding is of the "spotting" type and follows trauma. The cause of the bleeding is not a degeneration but a hyperemia. Hyperplasia of the myometrium is often present. Like the essayists, Whitehouse, Frank and others have called attention to the stationary hyperplasia which is usually present in these types of endometria.

At all events, whatever the etiology of the bleeding, which is so common in association with hyperplasia, irradiation by means of radium is practically specific in properly selected cases. A curettage and histologic examination of the curettage should be performed in every case in which radium therapy is to be employed.

DR. I. C. RUBIN, New York.—I would like to ask if it has been Dr. Novak's observation that there was evidence of secretory activity of those glands. The interesting thing in this problem is the relationship between endometrium and the condition of the ovaries. In 1918 I had occasion to operate on a young woman of 23 for the almost constant bleeding for a period of six months. This young woman had a curettage done, against my advice, and the bleeding continued. It was the first time in which I was able to demonstrate a perfect relationship between the ovarian pathology and so-called essential bleeding. Both her adnexa were appreciably enlarged and tender. The occupation of this woman was of the kind that suggested strongly the possibility of a genital infection and I suspected, therefore, that I was dealing with an inflammatory condition of the ovaries and the tubes but, to my surprise, I found that the ovaries were hypertrophied, studded with multiple cysts and the pelvis absolutely free, no signs of inflammation being present. I did a subtotal resection of both ovaries. This patient had a hemoglobin of 27 per cent and was a poor operative risk but I thought that that was the thing to do. She made an uneventful recovery and her menstruation became regular. I removed about four-fifths of those ovaries, leaving enough substance in each ovary to correspond in size to the normal vaginal ovary.

In studying the pathology of those ovaries we made a longitudinal section and they both presented the same picture. There were follicle cysts, varying in size from a tiny follicle to one tremendously dilated, resembling very much the picture of dilated glands that one finds in the endometrium itself and that is sometimes designated as follicular cyst hyperplasia.

Thereafter I had eleven or twelve cases, mostly in young women, seven or eight of them being in the puberty and adolescent stage and presenting this type of menorrhagia. The pathology was always the same. I feel that just as you can get bleeding in cases of hydatidiform mole where the huetin cysts in the ovary are secondary to the lesion in the uterus, the more common occurrence is bleeding from the uterus, secondary to these small multiple follicle cysts in the ovaries. The endometrial lesion is in these cases secondary. The absence of secretory activity in these endometrial glands corroborates the notion that it is follicle ripening that causes the proliferation stage postmenstrually, and that the formation of the corpus luteum following the rupture of the graafian follicle which initiates the secretory changes typical of the pre-gravid stage. The corpus luteum demonstrated by Dr. Novak was probably an abortive type of corpora lutea. In those I have seen the fully organized gland such as you see in a regular menstrual cycle was not present. The corpora lutea that are formed from the graafian follicles in cases of endometrial hyperplasia follow one on top of another in rapid and abnormal succession instead of coming month after month, perhaps two in three weeks or several in two months, hence no secretory activity or corkscrew-like formation of the glands is seen but rather this tremendous hyperplasia of the glands.

DR. HENRY T. BYFORD, CHICAGO, ILL.—I would like to call attention to one diagnostic point. When the hyperplasia affects the entire uterine mucosa down to the internal os, the internal os is nearly always dilated, or soft and easily dilatable. When I find this soft, easily dilatable internal os in nulliparae I look for hyperplasia with thickening of the membrane. Dilatation usually brings out a little clear thin mucus.

DR. WILLIAM P. GRAVES, BOSTON.—We have found in many of our early cases a precocious type of sexuality, and in some have definitely prevented the bleeding by suspension of the uterus and thus improving the circulation. I should like to ask if Dr. Novak has taken into account the musculature of the uterus in the etiology of uterine insufficiency.

DR. HENRY T. HUTCHINS, BOSTON.—I would like to ask what the treatment would be for hyperplasia with bleeding at the present time. I had a 16 year old patient with a very low hemoglobin and a profuse menorrhagia. I curetted at intervals of six months and then at intervals of one to one and a half years. She then married and gave birth to twins. I have a feeling that if radium had been used at that time the woman probably would have been sterile.

DR. CAREY CULBERTSON, CHICAGO, ILL.—It is extremely important to ask whether we are to regard this condition as a separate entity, to be taught in the laboratory and to the students, because, beginning systematically with the various changes that take place, this is one that must be considered by itself. Hyperplasia of the corpus mucosa is relatively frequent; it is seen in fibroids, in chronic metritis, and in the otherwise normal uterus. I am not convinced that it is much of a factor in uterine hemorrhage, however. The great majority of my cases—and for several years I have kept a careful tabulation of this feature—have shown that where excessive bleeding has occurred there have been present fibroids, chronic metritis, displacement of the uterus, and the various other factors that go with hemorrhage. In less than one-half the cases of hyperplasia in which there was no other explanation for the hemorrhage, there has been no excessive bleeding.

Dr. Novak also brought out the very interesting feature that certain of these hyperplasias are not associated with an increased thickening of the whole endometrium. In my experience this type of endometrium is almost entirely limited to the multiparous uterus, the uterus that has gone through a number of pregnancies, more than two, and I have explained it to myself as the result of regeneration after labor. The epithelial and glandular elements may regenerate better than the interstitial, so that we have a positive increase in the glandular, and a relative decrease in the interstitial, or—which amounts to the same thing—possibly there occurs a decrease in the regeneration of the stroma without an increase in that of the glands. The multiparous uterus is one that tends towards hemorrhage, so in a definite proportion of such cases we have excessive bleeding.

The rapid development of mucous hyperplasia was brought out. Such a membrane was seen in one of my patients who eight weeks previously had passed through a premature confinement.

One speaker brought out the idea of deficient secretion in these glands. This also has struck me as being rather significant, the fact that in many of these patients with hyperplasia there is no marked leucorrhea.

DR. ARTHUR H. CURTIS, CHICAGO.—Heape of England deserves credit for describing these changes a considerable number of years before, and it is rather significant that he also divided the cyclic changes into the four periods that were given many years subsequently by Hitschmann and Adler.

DR. NOVAK (closing).—Dr. Norris emphasized the fact that this condition is most frequent at the menopause, with which observation we agree. Unlike Dr. Norris we have not noted flattening of the gland epithelium in all cases. Very frequently the epithelium is quite high, even in glands of considerable size. This is one of the findings which suggest that the large dilated glands are not simple retention cysts. Dr. Rubin spoke of the absence of secretory activity in the hy-

perplastic endometrium, a fact which we also stressed in our paper. The ovaries in these cases characteristically show a large number of small follicular cysts. It would seem that follicular growth is responsible for most of the gradual day-to-day growth of the endometrium, while the periodic involution, so to speak, is due to the cyclical activity of the corpus luteum. The enormous overgrowth of the nonfunctional stratum of the endometrium is perhaps due to a great increase of the follicular stimulus, in the absence of the normal cyclical discharge.

I believe that the dilatation of the cervical canal, mentioned by Dr. Byford, might well be noted in these cases where the endometrium is greatly overgrown and polypoid. In cases where the endometrium shows little or no thickening it would almost surely be absent. In reply to Dr. Graves I may say that we have made no especial study of the musculature, although this has been done by many other investigators in an effort to find an explanation for functional hemorrhage. I do not believe, however, that any great number of cases can be explained in this way. Dr. Culbertson suggested that the polypoid overgrowth was to be found almost entirely in multipara women. We have frequently found it, however, in the cases noted in young girls at or near the age of puberty. I think that both Dr. Culbertson and Dr. Norris are correct in saying that we are perhaps not as yet justified in looking upon hyperplasia of the endometrium as a clinical entity. That it is a pathological entity, however, I believe we have established. Dr. Hutchins inquired about the treatment, which we have discussed in the paper, but which I did not have time to present in the time allotted. It is probable that certain mild cases correct themselves. Curettage is usually necessary, if for no other reason than diagnosis. Sometimes one curettage is followed by a readjustment and recovery. Sometimes repeated curettage is necessary. Radiotherapy is the ideal procedure in the menopausal cases, but must be used with caution in young women. Hysterectomy is at times necessary where radium is unavailable or where other conditions exist within the abdomen which make operation advisable.

Dr. Curtis referred to the work of Dr. Heape upon the menstrual changes in monkeys. Incidentally, I may say that Heape has established quite definitely the fact that the endometrium in monkeys is shed at the time of menstruation. Dr. Norris has questioned whether a similar loss of tissue is noted in the human female. I may say that I had exactly the same skepticism until a few months ago. Recently, however, Dr. TeLinde and I have studied this question in the laboratory of Johns Hopkins Hospital and we have convinced ourselves that there is an extensive loss of endometrium at the time of menstruation. These studies will be reported at the approaching meeting of the American Medical Association in Chicago.

DR. N. SPROAT HEANEY, Chicago, Ill., presented a paper entitled **Ethylene and Oxygen Anesthesia for Gynecological and Obstetrical Work.** (For original article see page 416.)

DISCUSSION

DR. C. H. DAVIS, MILWAUKEE.—I agree with all the experience even to the point of having had an explosion. I feel at the present time that the risk of explosion is the most serious drawback to the use of ethylene, but in connection with that attention is called to the fact that explosions with ether in the operating room are not infrequent. This should lead to an increased effort for safety in the operating room. In the past few months I have been trying to repeat some of the experiments previously made on pregnant and nonpregnant animals

with ethylene, to determine the possible dangers from its use during pregnancy. The results thus far are inconclusive. I have, however, certain impressions which I wish to leave with you. In the first place, the margin of safety with ethylene, in demonstrations on groups of animals, is very much greater than with nitrous oxide and oxygen. In several hours of continued use we have not had to remove a single animal for resuscitation; in similar experiments with nitrous oxide it was always necessary to remove one or more animals, and sometimes during an experiment. With nitrous oxide we have had sudden deaths of animals in the anesthetic chamber. Thus far that has not occurred with the ethylene.

One of the great advantages of ethylene in the operating room, which has been pointed out, is the rapid injection of anesthesia. We found that where we used a previous hypodermic of $\frac{1}{6}$ of morphia and $\frac{1}{60}$ of hyosein, an abdominal incision could be made just four minutes after the first whiff of ethylene. That means a tremendous saving of time in the average operating room.

In the animal experiments we found that ethylene causes a marked congestion of the kidneys, and that it affects the liver also in a similar way that nitrous oxide and ether affect these organs. In one rabbit I found slight evidence that its protracted administrations may cause liver injury which is slightly suggestive of the lesser injuries which we find with small amounts of chloroform. I think it is logical to expect that an anesthetic as powerful as ethylene might cause certain tissue injuries. This anesthetic may kill young guinea pigs *in utero*, probably due to asphyxiation, as is the case with nitrous oxide-oxygen.

Our experience shows that there is very little variation in the pulse during even a prolonged operation, and that the pulse pressure changes during the operation are very slight. In view of the animal experiments it would seem to me very probable that where there is a weak myocardium, ethylene would have a very distinct advantage over the nitrous oxide and ether combinations due to the fact that nitrous oxide always causes a certain degree of asphyxiation and more of a strain on the heart muscle.

Our operative results under ethylene correspond almost identically with those reported by Dr. Heaney. We believe the matter of explosions can be overcome and that ethylene will become a very useful anesthetic.

DR. JAMES C. MASSON, ROCHESTER, MINN.—So far as the anesthesia produced is concerned, ethylene is quite satisfactory, but there is no doubt that great care has to be exercised in using it. In Rochester we have used it in about 2000 cases. I was slow to change from nitrous oxide and ether to ethylene, and my personal experience has been limited to about 200 cases, most of which have been abdominal. In most of the cases a small amount of ether, varying from a few whiffs to an ounce and a half, was used with the ethylene.

In work on the vagina ethylene seems to be an ideal anesthetic from the patient's standpoint and it is practically never necessary to combine it with ether. At first I was inclined to think that there was more bleeding with ethylene, but it seems to vary considerably, and is probably not a serious objection as it is never enough to interfere with the operation.

In the last two years I have been doing a great deal of perineal work under transsacral and caudal anesthesia, and as a result have not used ethylene in many cases in which it would be entirely satisfactory. Local anesthesia is satisfactory for all perineal work and I generally advise it, but let the patients decide; more and more are consenting to have it used.

There is no doubt that the explosive quality of ethylene will always be a serious objection to its use. We had one slight explosion in Rochester. For-

tunately, no one was hurt, but I feel that no cautery or fire of any kind should be on the operating floor when ethylene is in use, and that all outfits should be equipped with safety devices, as advised by Dr. Lockhart.

DR. W. H. VOGT, ST. LOUIS.—My personal experience with ethylene has not been very great, but I have seen a great deal of its use in the hospital with which I am connected. The one thing that has struck me particularly in the use of ethylene was the beautiful recovery of the patient after operation, even in such cases as gall bladder operations where an exposure is oftentimes very difficult and where much manipulation becomes necessary and where ordinarily, vomiting and nausea persist for a long time.

The usual experience, I have observed, is that these patients vomit before they get off the table and that, as a rule, is the end of the vomiting and nausea. Consciousness usually returns before the patient has been returned to bed. Patients who have been previously operated upon and have taken ether, or the usual anesthetic, tell us how much more pleasant this anesthetic is.

Regarding the explosibility of ethylene gas, and warned by such reports as have been made today, we have invariably avoided and warned against the use of cauteries in the operating room. Another thing to which attention should be called is the fact that in some parts of the operating department, particularly in the rooms where the doctors dress, smoking goes on, and since this practice carries with it great danger, we have recently put up signs throughout the entire operating department that there must be no smoking in this part of the hospital when ethylene is being used.

I was glad to hear that Dr. Heaney has been able to use ethylene in his obstetric work, particularly in getting analgesia. He seems to think that it is very easily accomplished, and if so it is certainly very much better than the nitrous oxide gas, for with ethylene we can carry the patient over to a deep anesthesia much more readily than with nitrous oxide gas. This is of particular value in cases where we have decided to do a forceps delivery. With nitrous oxide gas a sufficiently complete anesthesia to do a forceps delivery or any major obstetric operation would necessitate the additional use of ether.

DR. JOSEPH B. DE LEE, CHICAGO.—We have been using ethylene at the Chicago Lying-In Hospital since about the first of January and in the main our experience corresponds with that of Dr. Heaney and Dr. Davis. We have not been entirely happy with its use although we have had no explosions. I have never seen an explosion from ether and we have used it now for thirty-three years. The objections to ethylene are the hemorrhages, which in our experience have been more annoying than has been reported by the others. Particularly when a cesarean section is done, the field is flooded with a bright blood which resembles somewhat the color of mercurchrome solution. Immediately upon ceasing the anesthetic the blood clears up. Two cases had convulsions, beginning mildly and becoming very severe. One woman almost died on the table after 30 per cent ethylene and 70 per cent oxygen. She had had $\frac{1}{6}$ of morphia and $\frac{1}{200}$ of scopolamin, so we did not know to which to ascribe the difficulty.

In obstetrics our experience has been very good except in a very few cases. It is probably better than ether for analgesia and we will continue to use it, but I think I would hesitate to give it unqualified endorsement.

DR. CAREY CULBERTSON, CHICAGO.—Being made by a number of manufacturers, occasionally the product distributed is not pure and with that there has been some trouble. Ethylene gas must be pure. Today if a new tank is used and the patient vomits persistently, that tank is discarded, this being accepted as a test of its impurity.

My experience with the gas is the same as Dr. Heaney's in every particular except one very important thing—thus far I have had no explosions, either in labor or in gynecological operations.

DR. THOMAS J. WATKINS, CHICAGO.—Following the work in the clinic of Dr. Heaney and others at the Presbyterian Hospital, we at St. Luke's Hospital became early interested in ethylene gas for anesthesia and have been employing it quite regularly since that time. Our experience has been much the same as that of Dr. Heaney, except we have not been unfortunate enough to have any explosions. We are possibly not quite as enthusiastic as we were some six months ago. Ethylene gas is in competition with nitrous oxide as an anesthetic. There is little or no difference between the two as regards the comfort or discomfort of taking them, or as concerns the postoperative effects. Ethylene gives less cyanosis and more relaxation than nitrous oxide. Ethylene produces enough relaxation for plastic pelvic surgery, but generally not enough for abdominal surgery, especially in complicated cases.

DR. M. PIERCE RUCKER, RICHMOND, VA.—In this connection may I show a hystero-gram of a patient who was given ethylene? This patient was a primipara whose labor was induced at term. The Voorhees bag was connected with a kymograph, and the patient was given a push button with which to signal when she felt pain. Up to the point that ethylene was started the patient signalled very accurately. As soon as the third pain under ethylene was finished she commenced to show a little incoordination. The uterine contractions became stronger and lasted longer after ethylene was begun. When questioned after the delivery as to the relief of pain, she said she was perfectly aware of having pains but did not feel them as pain. She was perfectly comfortable although she could feel the uterus contract each time.

DR. HEANEY, CHICAGO, (closing).—The danger of explosions with ethylene is very real and cannot be overemphasized and if in spite of all the warnings in the literature the surgeon uses a cautery and has an explosion, I think the courts would find him responsible. The points of particular importance in our two explosions were that they were static in origin, occurred in the same delivery room with the same anesthetist; and although there had been over 3000 administrations in the Presbyterian Hospital and these were the only two explosions, it would suggest that this particular delivery room may be electrically charged or that the anesthetist has some peculiarity in his physiology or clothing which makes him more dangerous as far as static electricity is concerned.

Ethylene is of particular advantage in bad surgical risks. For instance, a patient, sixty-seven years old, so extremely fat that her legs did not come up in lithotomy sticks until anesthetized, had an adenomyoma of the body of the uterus with suspected malignancy. She would have been a poor subject for ether or for nitrous oxide. We used ethylene, the patient vomited in the operating room, but not afterwards, was conscious at the time she was placed in bed, and had very little difficulty indeed during her convalescence. We did an abdominal hysterectomy on a diabetic patient of Dr. Woodyatt's, who was kept sugar-free with a great deal of trouble, and the patient's condition the next day was better than we would expect had local anesthesia been used.

NEW YORK ACADEMY OF MEDICINE
SECTION ON OBSTETRICS AND GYNECOLOGY

STATED MEETING, APRIL 22, 1924

DR. FREDERICK W. RICE IN THE CHAIR

DR. S. L. NEWMAN described a case in which was found a **Gold Pessary Imbedded in a Full Term Placenta.**

This contraceptive device was discovered sixteen months later imbedded in a normal placenta while the latter was spontaneously expelled during a full term normal labor.

Patient A. S., age twenty-six years, para iii, was admitted to the Beth Israel Hospital, February 13, 1924. Menstrual history normal. She was married six years and gave birth to two children prior to the last, without any complications

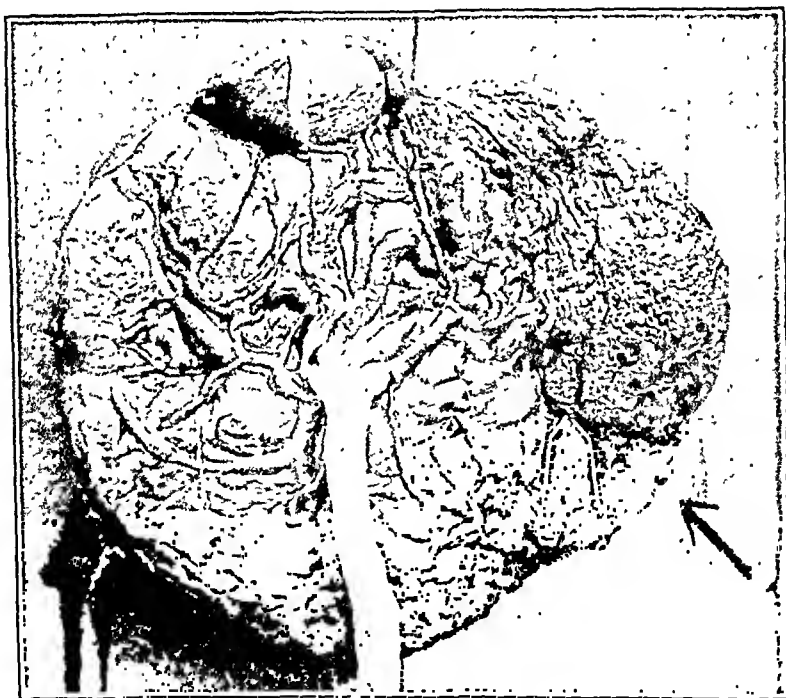


Fig. 1.

whatever. When the second child was three months old she was advised by a girl friend to consult her physician about some measure to prevent conception. Her physician inserted into her uterus a wish-bone pessary and told her to report a month later. This she did not do, but came to him several months later when she noticed that she missed a period. Her physician made a rather lengthy examination and informed her that he could not see the cap of the pessary and concluded that she must have lost the contrivance. Emmenagogues which he thereafter gave her proving futile, the patient concluded to go through with it and not try any other means to bring about an abortion.

Thereafter the pregnancy was uneventful. She felt no symptoms suggestive of a foreign body in her uterus and went to full term. Her delivery was spontaneous. She gave birth to a very healthy looking baby weighing 8 pounds 12 ounces. The placenta shortly afterwards began to be extruded from the vulvar orifice by a Schultze mechanism. The gold wire pessary was found imbedded in the placenta on the fetal surface as illustrated (Fig. 1). The amniotic membrane was torn off from the placental segment beginning at the site of the pessary, thus revealing more distinctly its rather superficial position.

The curious feature is that the pessary which was introduced prongs first was carried far into the growing uterus and in undergoing a complete version it became imbedded midway between the center and the periphery of the placenta, the prongs pointing to the margin. With the exception of some necrotic areas, this segment of the placenta showed no marked pathologic changes whatever.

The significant features of the case are as follows:

1. The pessary was a failure as a contraceptive measure in the first place.
2. Later on even with the reinforcements of emmenagogues it failed to curtail the pregnancy.
3. Patient suffered no inconvenience from its presence, no bleeding, no pains anywhere, and not even a leucorrheal discharge, so that the patient at the time of labor had completely forgotten the incident of its introduction 16 months prior.
4. The pessary was included in the amniotic sac and did not remain extraovular. The appearance of the blood vessels as well as the distal segment of the placenta showed that its attachment in the placenta was early.

DISCUSSION

DR. ARTHUR STEIN.—Although this device is inserted quite frequently, yet such accidents are rather rare. Only a week ago I myself saw a patient who gave the history of having a pessary of this type inserted by her physician about a year prior to her admission to the hospital. A few days before coming to us she went to a physician and asked him to remove the pessary and clean it. As he could not find it he advised a roentgenogram, which showed the gold pessary, without the cap, way up in the uterus. The two prongs were widely separated and we thought that they had entered the tubes. There was no difficulty in removing the pessary after dilating the cervix.

DR. FREDERICK C. FREED reported a case of Embryotomy and Hysterectomy in Chondrodystrophic Dwarf.

This case was brought in by ambulance to the service of Dr. Frederick W. Rice at Bellevue Hospital, December 9, 1923.

The patient was a female, forty-two years old, a chondrodystrophic dwarf with arms and legs disproportionately smaller than the forearms, the trunk and lower legs. Her legs were markedly deformed with anterior bowing. Her height was three feet and ten inches (115 cm.). She had a brachycephalic head and her musculature was well developed.

She was born in Italy, had had seven brothers and four sisters all of whom are now dead. None were deformed. Her father and one brother died of insanity. She nursed at her mother's breast for two years and did not walk until she was four years old. She had none of the usual diseases of childhood and has worked most of her life as a glove finisher. Her menstruation was established at fourteen years, was of five days' duration, moderate in amount and occurred every thirty days, her last period occurring March 6, 1923. She was unmarried and had had

two previous pregnancies resulting in spontaneous miscarriages at two and four months' respectively.

The membranes ruptured spontaneously at 5 A. M., following onset of labor pains at 4 A. M. Uterine contractions were strong, occurring every three minutes and lasting from forty to fifty seconds on admission. Her only attendant had been the ambulance surgeon.

By abdominal examination definite fetal parts could not be outlined due to thickness of abdominal wall and tenseness of uterus; irregular masses, however, were felt. No movements of fetus were noted and the fetal heart could not be elicited.

Vaginal examination revealed a foot presenting between the labia and a loop of nonpulsating umbilical cord beside it. High up in the oblique diameter of the inlet of the pelvis the other foot was felt, a tight ring of cervix was around the leg of the second foot. A slight amount of amniotic fluid that escaped was green and foul smelling.

Pelvic measurements were: Between spines 20.5 cm.; between crests 20.0 cm.; external conjugate 14.5 cm.; oblique—right 19.0 cm.; oblique—left 18.5 cm.; diagonal conjugate 6 cm.; true conjugate 4 cm.; height of symphysis 6 cm.; transverse of outlet 10 cm.; antero-posterior diameter of outlet 8 cm.

The patient was taken to the operating room, placed in the dorsal position on the table, given nitrous oxide gas and ether and painted with tincture of iodine. A fllet of gauze was thrown around the lower foot and prolapsed cord and with some difficulty a second fllet was put around the other foot. The abdomen was opened from below the umbilicus to the symphysis pubes, uterus exposed, found to be tense and to contain multiple tumors. Uterus was incised *in situ*. It was so tight about the fetus that a decapitation was necessary and the head was removed before the legs could be reached for amputation; also baby's abdomen was opened and finally the legs and cord were amputated and these were pulled out through the vagina by an assistant drawing on the fllets. The torso was removed through the abdominal wound; likewise the placenta and membranes. Clamps were applied to the broad ligaments, bleeding controlled and supravaginal hysterectomy done. The abdomen was closed in layers, without drainage.

Pathology: Endometrium was greenish brown and foul smelling. Uterus showed numerous fibroid tumors varying in size from a pea to a small hen's egg, some undergoing degeneration. Estimated weight of fetus was seven pounds and its skin showed signs of beginning maceration.

Highest temperature 100° F. on second day, highest pulse rate 96 on second day. Wound healed by primary union and patient was discharged on the sixteenth day, and is now back at her usual work.

DISCUSSION

DR. HAROLD BAILEY.—I believe that Dr. Freed did exactly the right thing. One might think that it would be easy to puncture the head and remove it collapsed, but occasionally in spite of all kinds of manipulations it is very difficult to succeed. The removal of the uterus in all probability led to the good result in this case.

DR. RICE.—We had two other cases at that time with absolutely contracted pelvis, and there was no question but that cesarean section was definitely indicated. The question that did come up though was whether to do a hysterectomy. In both cases there was a discharge of foul lochia from the uterus. In one case we decided to sew the uterus up and put drainage in the uterus and in the culdesac. This patient recovered; the other case we did not drain and the patient died. If I had a

similar case in which there had been a great deal of interference and infection was suspected, instead of attempting a conservative operation I would remove the uterus.

DR. MENAS S. GREGORY read a paper entitled **Mental Disturbances Associated with Childbearing.** (See page 420.)

DISCUSSION

DR. GEORGE H. KIRBY.—Dr. Gregory has shown that with the progress of modern psychiatry the old conception of puerperal insanity has gradually become untenable until it now seems to be about ready to disappear altogether. Childbirth as an etiologic factor has taken its place among the exciting or precipitating causes of mental disorder. We now recognize it to be a cause which, under certain circumstances, may bring about a number of different types of psychotic reaction. However, we still have the problem of how and why childbirth acts to bring about a mental disturbance and a further problem of what can be done to prevent such a distressing event from taking place.

In one group of cases, as Dr. Gregory has pointed out, the situation is relatively simple. These are the cases where childbirth is complicated by the presence of a toxic or infectious condition. Mental reactions to toxic or infectious agents are in general very much the same whether the case is a puerperal one or not. We deal here with a type of mental disorder to which any woman may succumb if sufficiently overloaded by toxemia. There is little doubt but that these toxic-infectious cases have in recent years noticeably decreased. I see septic cases much less frequently than formerly. In fact, the infrequency with which these septic cases are now seen in state hospital practice is quite remarkable.

In a second and much larger group of cases which arise in connection with childbirth, the situation is quite different and the etiological relationships are less evident or at least are more complex. This group is made up principally of manic-depressive and dementia precox cases, the symptoms and course of which Dr. Gregory has very clearly outlined in his paper. Although these disorders are very frequently precipitated by childbirth, yet we have reasons to believe that the more fundamental cause is to be found in the mental constitution and the underlying emotional reactive tendencies and disposition of the individual. In other words, when these types of mental disturbance occur in connection with childbirth, they seem to depend to a large extent on the way the individual has been psychologically conditioned in earlier life; there seems to have been established a predisposition to react abnormally to childbirth. One is perhaps justified in saying that only certain constitutional types of women are in danger of breaking down with these psychoses under the influence of childbirth.

Clinical experience teaches that although childbirth is a normal physiological function, yet it becomes in certain individuals a stress, particularly a psychologic stress, under which they break just as we see individuals break down in other situations. Dr. Gregory in describing the case of a man who lost his pocketbook gave a good illustration of the way an acute psychologic stress may precipitate a psychosis. A somewhat similar case which I saw was that of a woman whose baby was casually taken from her into another room while the mother slept. On awaking and finding the baby gone she at once developed a psychosis and insisted the baby had been stolen. Although the baby was immediately brought back to her, it did not cure her. In such a case there was probably a subconscious desire to get rid of the baby. In the ideas, imaginations and delusions of cases developing with childbirth, we can often see the underlying mental conflict revealed and this may

indicate to us quite clearly the reason why the individual reacted to childbirth with a psychosis. For instance, if a patient, in a psychosis following childbirth, shows marked antagonism to the husband, denies the marriage, shows aversion to the child, gives her maiden name or claims to be a virgin, it is fairly plain that there is an underlying conflict referring to married life, and in such cases we get some idea of how the childbirth, in cementing a union distasteful to the patient, was a factor in bringing about a psychosis, the latter in a way being a reaction against the idea of marriage.

All these cases, whether we call them dementia precox or manic-depressive insanity, have their own individual psychological problems and, as Dr. Gregory has so well emphasized, it is a field which offers very great opportunities for preventive work and for mental hygiene. The first step is for the physician to know his patients better and take the same sort of interest in the mental health as in the physical well-being of those who come under his care and observation. As a matter of fact, we can see in many cases already before the actual mental breakdown occurs, even by casual observation, that there are personality traits of an unhealthy kind and a lack of mental adjustment in the home and family life which may foretell disaster under the stress of childbirth. In certain cases it may be obvious that the person has not progressed psychologically or emotionally to an adult sexual level and that it may therefore be impossible for her to make a satisfactory adaptation to married life and childbirth. A study of the cases of the type mentioned makes it plain that a mental disorder occurring in connection with childbirth may have back of it a very complex etiology, an etiology which contains factors reaching back into the early years and developmental period of life; and we have, I think, reason to believe that these factors are often of more importance than the immediate stresses of childbirth as we usually understand them.

DR. A. A. BRILL.—I should like to add a few remarks to what was said about marital maladjustment during pregnancy. Such difficulties are particularly observed in the neurotic types, for in addition to the psychotic disturbances we find a great many psychoneuroses. Moreover, even those who are not neurotic or psychotic often have to struggle with vital problems. I have often wondered why the obstetrician is so reluctant to discuss matters dealing with sex when his specialty is so intimately connected with this function. Take, for instance, the question of sexual relations during pregnancy. Many pregnant women or their husbands often wish to be enlightened about it; it is of great importance to them, but when they consult their obstetricians they often get no answer, or the answers are more confusing than enlightening. I am also aware of the fact that some obstetricians forbid sexual relations during pregnancy. There may be some reason for this in some of the cases, but my experiences have taught me that unless there are definite indications to the contrary, normal sexual relations should continue, for months of abstinence may not only bring to the surface all sorts of neurotic affections in the woman but do much harm to the social and moral status of the family. I know of one man who resorted to homosexual practices after abstaining for a few months (to be sure, he was more or less predisposed to it), and many others who became involved in illegitimate sexual affairs with the usual pernicious results. I have seen many neurotic outbreaks in pregnant women who worried over such matters. I brought up this question in order to hear your expression of opinion about it.

It is my opinion that there would be very few neurotic disturbances during pregnancy if the obstetrician and general practitioner would be more interested in the emotional life of their patients and would pay some attention to their psychic needs. After all, pregnancy is a normal physiologic process and should

be impressed as such. There is very little or hardly any reason for expecting every pregnant woman to be afflicted with "vomiting of pregnancy." I have seen a number of women who manifested this so-called physiologic symptom in a severe form whom I cured of it psychically. I can also mention cases who had marked vomiting spells during the whole period of pregnancy but who hardly showed any vomiting during their pregnancies after they were treated psychoanalytically. Dr. Brunschweiler of Zürich actually believes that practically all vomiting of pregnancy is psychic and only very slightly physiologic. I fully agree with him. I always find it in severe form in women who have a definite resistance to pregnancy because of conscious and unconscious dislikes for the husband. It is purely hysterical.

I fully agree with Dr. Gregory that there is no such disease as puerperal insanity, that which is so-called belongs to one of a number of psychotic pictures which may be precipitated by pregnancy. I also feel that there would be very few neurotic symptoms of pregnancy if the patients were differently managed. If the patient would not be told that she will have vomiting of pregnancy and that she will be more or less invalided by it, but if she would instead be impressed with a normal "health conscience," there would be very few severe neurotic disturbances of pregnancy. To be sure, those who take up suggestions and react to them are neurotically predisposed in the first place, but even here much can be done by the obstetrician who pays some attention to the psychic and emotional factors of his patients and who is not squeamish when he is confronted with sex problems.

DR. W. L. RUSSELL.—The few remarks I have to make relate to 71 cases treated at Bloomingdale Hospital. The study, which is being made by Dr. Ticbout and Dr. Kilpatrick of the Hospital Staff, is along slightly different lines than that of Dr. Gregory's, in that patients were omitted who had chronic mental disorders when they became pregnant. All were cases that developed during pregnancy or after childbirth. The present presentation is a preliminary one and the full study will be published later.

Of the 71 cases, 36 were in their first pregnancy; 35 were multiparae. Of the latter 29 were in their second or third pregnancy, all but 6 cases were within the first three pregnancies. In 49 cases there had been other cases of nervous and mental disorders in the family, the inquiry covering 3 generations; 70 per cent therefore belonged to stock in which nervous or mental disorders had occurred. In 64 per cent there was distinct evidence of mental instability in the personality of the individuals, shown by the fact that the women were susceptible to reactions in the direction of mental or nervous disturbances. In 42 cases there were definite physical factors that could be held responsible for the mental condition. Septic infection was present in 22 cases, or 30 per cent. In 22 cases there was poor marital adjustment, and in 35, or 50 per cent, mental factors were apparently operative in bringing about the disorder. In only 8 of the cases did the disorder appear during pregnancy. Of the 63 postpartum cases, 15 became mentally ill within a week after the birth, 18 remained well for more than a month, and 2 did not show signs of mental disorder for six months.

The types of mental disease met with in this series indicate clearly that there is no distinct type of mental disorder characteristic of the puerperium. The types were as follows: Depressions, 26 cases, in 10 of which there was some confusion; 22 were cases of delirium, 11 of which were clearly of toxic origin while in 12 no source of toxemia was discoverable; six were cases of manic excitement, and three were of circular type; 10 proved to be deteriorating cases, though in some instances the onset was very acute and the reaction of a delirious type. There

were three psychoneuroses. The cases of depression with confusion, the benign cases of delirium in which a toxic origin could not be clearly shown, and the frankly toxic cases, 33 in all, constituted 46 per cent of the total cases. In many of the cases which were not frankly toxic, a high white cell count, and a degree of delirium-like confusion strongly suggested a toxic condition.

As to the results, 10 cases proved to be of a deteriorating type; of the remaining 61, 28 had recovered when they left the Hospital. All the cases of depression and manic excitement made good recoveries eventually. Complete information concerning the cases of delirium is not yet available, though undoubtedly recovery was the rule. The psychoneurotics made a good adjustment.

We feel that the number of cases is too small for broad generalizations, but they seem to indicate that mental disorder is a distinct menace belonging to child-bearing in patients with a tendency to react in a neurotic or psychotic way, and to some others. This is a danger which the obstetrician should realize. It would be advisable for him to make some inquiry as to the family history of the patient, and as to her makeup with special reference to aptitude for psychotic or neurotic reactions. By so doing he would be prepared to anticipate danger. The manic-depressive and delirium types, which made up 70 per cent of the total number, were favorable as regards immediate recovery. Mental factors were apparently even more potent than bodily changes in our cases. Other factors are not, of course, to be regarded as purely incidental, but the mental factor may render the patient very prone to react in a particular way. Marital maladjustments seemed to us to play a specially important rôle. Some previous studies made at the hospital, and also the observation of army physicians, seem to show that exhaustion alone rarely, if ever, produces a psychosis. If it does produce mental disorder, it is very transient, and usually other factors are combined with it. The fact that 14 per cent proved malignant, is quite important and shows that one has to be careful in prognosis even in cases that begin with rather benign appearing types of reaction. An important practical observation is that the depressive cases were so often acutely suicidal; 16 of the depressed cases were extremely suicidal.

DR. HAROLD BAILEY.—I should like the term "puerperal insanity" removed from our nomenclature, for it implies an onus that falls on the obstetrician. This condition, even the major variety, is not at all infrequent, and we see a great many of the milder types.

I recall five or six cases that represent almost every type of mental disorder that has been spoken of. We see these mental disorders frequently after eclampsia but most of them subside within a few days. Instead of the term "puerperal insanity" we should speak of mental disturbances accompanying pregnancy and the puerperium.

I have seen but one case of wildly maniacal septic psychosis. There are few cases of mental disorder due to sepsis. On the other hand we see depressions frequently in early pregnancy. If the mental disturbance occurs in the latter part of pregnancy, labor is induced and the patient passed over to Dr. Gregory and others trained in the care of mental diseases, but if it occurs in the early part of pregnancy we must decide whether it is better to interfere or not. As all obstetricians know there is a peculiar mental attitude in the pregnant woman. Many of the cases of vomiting of pregnancy are due to a greatly disturbed mental condition. Some of us believe that the vomiting is due to acidosis and induce abortion. One case of mental disturbance that Dr. Gregory had under his care for six weeks, recovered as soon as the uterus was emptied.

We also find the queer condition mentioned by one of the speakers in which the woman has an aversion to her husband or to the doctor. I believe that a great

many women are abnormal during pregnancy and I never treat a woman as normal until the first three months have passed and the placenta is functioning.

There are other manifestations of minor character. We see this in the case with which mental control of the patient is obtained during labor. If the doctor has the correct training he is able to control the mental attitude to a great extent and to remove the fear. The older men possessed this ability to a greater degree than we do today. Perhaps the younger men are too hurried and depend too much upon anesthetics.

I had one patient who lost her memory. She was undoubtedly of the depressive type. She came into my office with no recollection of anything, not even of her name. I sought the aid of an alienist, but by the time he arrived she was restored. I know of another woman who was blind. She was brought to the hospital by a physician and by evening was perfectly well again. The eye examination showed absolutely nothing.

DR. BETTY FAIRBANKS.—I think it would be of great interest to those practitioners with less experience in the treatment of mental disorders than Dr. Gregory, if he would indicate those types which would be likely to show amelioration of symptoms on the emptying of the uterus. I recently saw a woman who had complained of terrifying thoughts, they were hardly impulses, which flashed into her mind, and caused her great distress. For instance she said, "I suddenly think what would happen if I drowned my little girl?" At the time of her fourth pregnancy it was reported to me that she was acting queerly and continually bathing her children. I was quite alarmed, and urged the obstetrician in charge of the case to empty the uterus, which, as she showed no toxic signs, he was most unwilling to do. She fortunately aborted herself and the mental signs cleared up. In this type of case it seems to me that the pregnancy was responsible for breaking down the normal resistance of the patient to fantastic impressions and that she was extremely likely to commit some act that would necessitate her confinement as a lunatic, with disastrous effects for the other children.

Another patient developed confusional insanity, and the abortion only served to increase her general melancholy, and if possible her symptoms were more marked than when she was looking forward to the baby. In my own very limited experience, the phobias which usually occur in primiparae, can safely be treated with moral suasion, but in the more serious types of mental derangement it would be of the greatest value if Dr. Gregory would indicate the general lines along which the physician should work before he has to have recourse to Bellevue or Bloomingdale.

DR. F. W. RICE.—I should like to ask Dr. Gregory, in connection with the case in which there were recurrences of mental disturbance in a patient who had a prolonged first attack, how he would classify that case. There is no question that we as obstetricians have a great deal of work to do in the directions pointed out by Dr. Gregory and those who have discussed his paper, for thus far we have made very little start in the application of mental hygiene in obstetrics. We must learn to manage these patients, for they require intelligent handling. We know that most patients show some mental reaction to the physiologic changes associated with pregnancy. We know for a fact, however, that only 40 per cent of pregnant patients have nausea and vomiting, and if these symptoms are due to toxemia, as has been claimed, it is unlike any other type of toxemia that we encounter in that there are no urinary or blood changes and these symptoms almost always develop in patients with a neurotic tendency. Indeed, we often can tell in advance which patients are likely to suffer from nausea and vomiting, and we find that we obtain wonderful results by the use of suggestion. If patients of

this type are given encouragement and can be influenced to adopt a proper psychic attitude, they experience little or no vomiting. In cases of pernicious vomiting, if a patient is transferred to the hospital, away from friends, and gets no unnecessary sympathy, no opportunity to talk over her condition with friends, her symptoms abate very rapidly in the different environment. We try to make the patient understand that there is to be no induced abortion; and with proper rest and by using the stomach tube, colonic irrigation and keeping visitors away, the patient very soon improves. It seems to be human nature for women to tell a pregnant woman the most horrible things they have heard in connection with childbirth, though it is hard to explain why this should be. In view of this fact we advise our patients during pregnancy against talking about their condition to other women.

Dr. Bailey spoke of the advantage that came from the patient having confidence in her physician. If she has this confidence in him, when he tells her that she is not going to have a difficult time during labor and then is present at the beginning of labor and relieves her pain, that terrible anxiety that so many women experience will be done away with. We can explain to the patient that the dangers and suffering in childbirth today are not so great as they formerly were. She can be told that more can be done to alleviate her pain and that the dangers of infection are not so great.

DR. BAILEY.—I should like to ask Dr. Gregory what he thinks about children born of these women who are decidedly mentally disturbed.

DR. GREGORY (closing).—I am glad to learn that the value of mental hygiene in obstetrics is much more appreciated than I had anticipated.

The question as to when the uterus should be emptied, must be decided according to the individual needs of each case. In some cases the emptying of the uterus might be harmful; in others, it should be done, as it might be the only way to save the mental health of the mother. I recall the case of a rather intelligent young mother who, six years prior to the onset of the psychosis, married a young man whom she admired, with the mental reservation, however, at the time of her marriage, that he might not have been the ideal mate for her. Her mental malady was in the nature of a manic-depressive psychosis, with strong suicidal impulses. Among other notions which she expressed during her illness, she referred frequently to the fact that she did not love her husband, that she had made a mistake in marrying him, that she now distinctly recalled that before and at the time of her marriage, she had entertained doubts regarding her love for him, etc. On a closer analysis of the situation, it seemed to me that, although she did not look upon her husband as an ideal one, nevertheless, she had a great deal of admiration and regard for him. In the early stages of her illness, this patient became pregnant, and we were confronted with the important question whether pregnancy should be interrupted, in the interest of her health. After careful consideration of the situation, I deemed it advisable to permit the pregnancy to continue, as it was my opinion that motherhood, in this particular patient and at this particular time, would serve to bring her to a closer psychologic contact with her husband. The pregnancy continued and at the seventh month she was perfectly well mentally. She was delivered of a full term child and has remained well and happy since.

This was a case, then, in which it would have been a great mistake to have emptied the uterus, as I am quite certain the psychosis would have taken on a much more serious aspect.

Another instance is that of a patient who had had two previous attacks of manic-depressive psychosis, one associated with child-bearing. She again became pregnant and naturally the question arose whether it would not be advisable to

interrupt the pregnancy, as there was danger of her having another similar attack.

As this woman was laboring under considerable fear that she might have another attack of mental trouble,—the anxious anticipation which I referred to in my paper,—I advised that the uterus be emptied, which was done. She has remained well ever since.

The point is, that in dealing with psychiatric problems of this kind, we cannot follow any set rules, but that each case must be dealt with according to the circumstances surrounding it, whether inherent or environmental or both.

What was said about phobias in connection with pregnancy was very interesting. Phobias and fears in pregnant mothers are not uncommon, although I have seen comparatively few such cases.

When a pregnant mother suffers from a phobia of any sort, the same rule as in the case of the psychotic disorders which I mentioned above should be followed. If the personal makeup of the patient is such that we might expect a reasonable response to treatment, it would be advisable to permit the pregnancy to continue. If, however, we are dealing with a psychopathic personality, burdened with unfavorable heredity and unfortunate social and environmental conditions, the termination of the pregnancy might be considered.

Patients with amnesia have the same mental mechanism as the case I have mentioned in my paper, namely, the man who lost his mind as a result of the fear that he might lose his pocketbook. This man undoubtedly had some unconscious desire not to return home, and his brief attack of mental trouble was the unconscious realization of this wish.

The same mechanism applies to the case of the woman who feared that she might go "crazy," or to the other who had a fear that her baby might be born dead; in both these cases it may be said that there were some unconscious reasons why the children were not wanted.

The point I wished to emphasize in this paper, was that pregnancy and child-bearing *per se*, have no direct causal relation to mental disorders occurring during those periods; that one may observe any type of mental disorder in connection with childbearing; that the mental disturbances occurring in this period may be of benign or chronic type and that they may be of short duration or may last for a prolonged period. Further, I took this opportunity to call attention most particularly to the fact that we as physicians pay very little attention to the mental conflicts of our patients, whether we are obstetricians, internists or surgeons, and that at least part of our failures in the treatment of our patients may be traceable to this neglect.

The various healing cults, such as Christian Scientists, Mental Healers, New Thought teachers and even fortune tellers, flourish upon this very failure to recognize on the part of the physician the value of psychic factors in the treatment of physical disorders. The obstetrician should keep in mind the fact that the pregnant mother is laboring under tremendous physical and mental stress, and that frequently a sympathetic attitude, with a conscious concern regarding the psychic welfare of his patient, may often lighten her mental conflicts, even to the extent of preventing a mental breakdown.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Eclampsia

Lévi-Solal and A. Tzanck: New Experimental Researches upon the Pathogenesis and the Therapeutics of Puerperal Eclampsia. *La Presse Médicale*, Aug. 1, 1923, p. 669.

The authors review briefly the various theories regarding the pathogenesis of eclampsia. They conclude that the evidence shows that the organic lesions found at autopsy are inconstant, are produced by eclampsia or by the pre-eclamptic state, and that we cannot consider eclampsia as caused by renal, hepatic, or endocrine disorders. Such lesions as are found may predispose to eclamptic convulsions, but cannot be considered as the exciting cause thereof.

By animal experimentation, the authors have found that serum from eclamptic women is toxic, 1 to 2 c.c. per kilo of body weight being fatal to the guinea-pig, while this animal is not affected by serum from men, from normal women (pregnant or not), or from other animals, even when given in doses 6 to 8 times as large. In these experiments, the serum was administered by intracardiac injection. Bar, as well as Landsteiner and Grafi, performed similar experiments and reached the same conclusions. Further work has convinced the authors that eclamptic serum contains two toxic principles, one convulsant, the other equally lethal but not convulsant. The former principle is rendered innocuous by heating to 55° C., or by disintoxicating the eclamptic by treatment. The second principle is not thus dissipated, is found in the serum of former eclamptics with slight renal or hepatic insufficiency, in the serum of albuminuric women with hypertension, in the serum of pregnant cardiopaths, and was also found in the serum of an icteric woman in labor. These facts appear to show that a part of the eclamptic toxemia is due to organic alterations, which produce the second toxic substance. Death from the first toxic principle, as observed in animals, is typical of human eclampsia, with convulsions, soon followed by death. The second principle makes the animals torpid and somnolent; they lie quietly on their sides and die without convulsions.

A study of the question of massive coagulation, so often found at autopsy on eclamptics, convinced the authors that such findings are merely incidental, and not the cause of death. Experimentally, they found that by injecting animals with anticoagulants (non-toxic doses of sodium citrate or of sulfarsenol), followed by fatal doses of eclamptic serum, death was not averted but the blood was found fluid at autopsy.

The authors are of the opinion that the phenomena of eclampsia are identical with those of anaphylactic shock. This view they support: (1) by the clinical picture, i.e., the suddenness of the attacks, possible recurrence in successive gestations, and frequent disappearance of symptoms with intrauterine fetal death; (2) by the behavior of the injected animal, it lies quietly for 1 to 3 minutes, pruritus then de-

velops, followed by convulsions, and the heart continues to beat for several minutes after respiration ceases; (3) by the biologic behavior of the convulsant principle, which is similar to that of anaphylactic principles.

Naturally, the placental villi are thought of as the source of the toxins. The authors have been able, with unautolysed filtrates from the placentas of eclamptics, to produce effects identical with those following the administration of eclamptic serum. However, not all eclamptic placentas have reacted thus; furthermore, typical convulsive attacks were obtained with the filtrate from a luetic placenta and from a twin placenta. This placental toxicité was independent of any coagulant phenomena.

It was considered likely that susceptibility to this placental toxin varied according to the vagosympathetic tone, so drugs acting particularly on the sympathetic system, i.e., adrenalin, atropin, eserine, and pilocarpine, were tested for their protective values. Of these, pilocarpine hydrochloride, in the dose of 1 mg. for a guinea pig of 500 to 600 gm., when mixed with a lethal dose of eclamptic serum or of placental extract, prevented the death of the animal in over 80 per cent of the tests. The other drugs did not protect. Furthermore, experimental anaphylaxis, e.g., that produced in animals sensitized against antidiiphtheritic serum, was prevented by the serum-pilocarpine mixture, while death was the rule in the control animals.

Clinically, one case of eclampsia was treated along these lines with success. Patient had nine convulsions before the injection of 5 mg. of pilocarpine hydrochloride, but none after the injection. The dose was repeated three times in the first twenty-four hours, as the investigators preferred to take no chances. E. L. KING.

Sellheim, H.: Eclampsia and Pregnancy Toxemia as a Specific Disease of Human Reproduction and Culture. Medizinische Klinik, 1923, xix, 1143.

The idea is old that eclampsia depends upon the extraordinary demands made upon pregnant women, hence the frequency of eclampsia in primiparas unaccustomed to this task and in cases of multiple pregnancy where the burden is much greater. Eclampsia occurs in humans only, hence we must seek the difference between the human female and the female of the lower animals.

Labor in women is attended with mechanical difficulties. The development of the upright position brought about a marked pelvic closure and a greater curvature to the birth canal which must be overcome with greater force. On the part of the child, the larger size of the brain produces a larger skull which makes labor more difficult. The most important factor, however, in eclampsia is the great demand made on the body metabolism which results in a poisoning due to faulty protein metabolism.

Among those who live on a vegetarian diet there is less eclampsia than among those who live on an animal diet. Eclampsia is also much more common in cities than in the country because the people who live in the country live a more natural life. Among primitive races eclampsia was almost unknown.

Some authorities on the study of sera, claim there are lability tests of the blood for the triad, syphilis, neoplasms and pregnancy, thereby classifying pregnancy as a disease. There are evidences which indicate that pregnancy and labor among the cultured races border on the pathologic. Examples are the appearance of abdominal striae, diastasis of the recti muscles, perineal lacerations and relaxation with subsequent prolapse of the uterus, etc., all of which are lacking in unhindered nature. In the light of this, Sellheim believes that eclampsia and the other toxemias of pregnancy are specific diseases of human propagation and culture.

J. P. GREENHILL

Lawrence: *Studies in the Etiology of Eclampsia.* The Pennsylvania Medical Journal, 1922, xxv, 771.

Eclampsia is a generalized toxemia terminating in an anaphylactic reaction, the convulsion. The course of the disease is divided into three stages: mild, severe and convulsive. Low mentality, faulty personal hygiene and pre-existing lesions of the eliminative systems seem to the author to be the factors determining the extent and severity of the complex. Constipation, edema, headache and albuminuria are symptoms common to all stages of the toxemia. A period in which the body is oversaturated with foreign protein (chorion) is followed by acute pulmonary and cerebral edema and convulsions. As evidence of the anaphylactic nature of the convulsions the author calls attention to the favorable results from measures directed toward raising antibody production and decreasing the amount of foreign protein discharged into the system. Convulsions follow failure of antibody production. Colonic irrigation, gastric lavage and morphine increase antibody formation. Fetal death, delivery and phlebotomy frequently control convulsions by checking the production and distribution of fetal toxins. Repeated convulsions, pre-existing lesions of the liver and kidneys, anesthesia, too early administration of food, cerebral stimulation by noise, light, etc., and failure to properly manage pulmonary edema are factors having an unfavorable influence on antibody formation.

H. W. SHUTTER.

Kark, S. E.: *Eclampsia: Evolution as a Causative Factor.* The British Medical Journal, June 10, 1922, p. 912.

The author considers the changes which take place during pregnancy. He considers the enlargement of the pituitary body during pregnancy as indicative of increase in its secretory function, and discusses a possible relationship between hyperpituitarism and eclampsia. He draws some analogy between acromegaly and eclampsia, and defines certain symptoms as being due to changes in the anterior lobe and others due to changes in the posterior lobe of the hypophysis. He thinks that eclampsia is essentially a physiologic process overdone and is due to an excess rather than a perversion of an essential product.

F. L. ADAIR.

Wuth: *The Eclampsia Question.* Deutsche medizinische Wochenschrift, 1922, xlviii, 1339.

As a psychiatrist, Wuth interested himself in the eclampsia question and studied the blood of eclamptic patients in Döderlein's clinic. He was especially interested in Zangemeister's theory according to which eclampsia is caused by a retention of water in the tissues and incidentally in the blood. He did find that in some cases there was a marked deficiency of serum albumin, which, however, was not constant. The proportion of serum albumin, furthermore was not always in the same ratio as the number of red blood cells which might be expected if the blood were simply diluted. Since convulsions of any kind have a tendency to raise the quotient of serum albumin, Wuth feels that these findings do not contradict the theory of Zangemeister, even if they do not exactly prove it.

He does not agree with Zangemeister when he thinks that the kidney function is not disturbed except that there is a retardation in the excretion of chloride. Like Caldwell and Lyle he found that retention of creatinin was the rule, while the percentage of urea was constantly increased. He considers this definite evidence of an impairment of the secretory function of the kidneys, but does not thereby imply that kidney impairment is the cause of eclampsia, a question which, he feels, is yet to be settled.

R. E. WOBUS.

Hoenhorst: Eclampsia and the Weather. *Zentralblatt für Gynäkologie*, 1924, xlviii, p. 113.

The effect of the weather on incidence of eclampsia has often been suggested, usually without statistics in relation to meteorological records—for example, the diminution of the excretion by the skin in moist weather, the damage to the kidneys from cold. Linzenmeier has suggested that autumn and spring days, cold and damp with northwest wind, and summer temperature with very moist atmosphere were associated with eclamptic attacks. Hoenhorst finds in Kiel a somewhat greater incidence in the spring months, with unsettled weather, but very little difference in the other three seasons. Tables are given with atmospheric pressure, temperature, relative saturation of the atmosphere, clouds, winds, rain, snow, etc., in relation to various clinical cases and show definite relation between the character of the weather on the one hand and the frequency of eclampsia on the other. Naturally, the weather is seen not as a causal factor in the toxemia, but solely as a factor in the onset of the convulsion.

LITTLE.

Ottenberg: The Etiology of Eclampsia. *Journal American Medical Association*, 1923, lxxxi, 295.

Ottenberg discusses McQuarrie's contribution dealing with the incompatibility of mother's and infant's bloods as a causative factor in eclampsia. The author was working on the same problem in 1911, when he came across Dienst's work which was along the same lines, and this caused him to abandon his publication at that time. Ottenberg still supports the Dienst theory, that eclampsia is a transfusion of incompatible blood of the child into the mother's circulation as a result of communication between the two. Although it has been abandoned by Dienst, Ottenberg offers several suggestions to further support the above theory, and several problems to be solved by experimental theory.

W. KERWIN.

Frey, F.: Eclampsia and Hydatid Mole. *Schweizerische Medizinische Wochenschrift*, 1924, liv, 134.

The author briefly reviews some of the common theories of causes of eclampsia and especially comments on the fact that the presentation of such a case as his definitely demonstrates that the theory wherein the fetus is primarily the cause cannot be accepted. He reviews the literature of hydatid mole showing eclamptic symptoms. The patient was a primipara twenty-nine years old, apparently six months pregnant. From the fourth month onwards she was showing albumen in the urine together with severe headaches and ocular disturbances. She had some bloody discharge just before entrance to the hospital and five convulsions. Despite a high temperature a transcervical cesarean was done and the mass removed. She was put on the modified Stroganoff treatment and speedily cleared up as far as symptoms were concerned. In commenting on the case the author suggests that perhaps the real cause of eclampsia is not the poison from waste products of the fetus or the inability of the placenta but perhaps is due to a disordered function and an inner secretion of the placenta itself.

A. C. WILLIAMSON.

Soli: Contribution to the Study of Changes in the Placenta in Eclampsia. *Annali di Ostetricia e Ginecologia*, 1923, xlv, 327.

Fifteen placentas from eclamptic patients were studied by the author, and the findings compared with those from the placentas of 10 normal cases, 5 cases with albuminuria but without convulsions, and 5 syphilitic cases. The eclamptic placentas showed no characteristic macroscopic alterations to distinguish them as a group from

the others. Histologically, on the other hand, the former invariably showed extreme congestion and dilatation of the villous capillaries, diffuse in some cases, focal in others. The placentas from albuminuric cases showed histologically edema of the villi and of the larger vessels, but this picture, though suggesting that of eclampsia, was of much less frequency and intensity.

The writer considers that an alteration exists in the villous capillaries in eclampsia with diminished resistance of their walls; that this justifies the possibility of a direct escape of fetal blood into the maternal circulation; and that this supports the idea of the anaphylactic nature of the eclamptic seizure.

THOS. R. GOETHALS.

Oppenheimer, W.: The Significance of Icterus in Eclampsia. *Monatsschrift für Geburtshülfe und Gynäkologie*, 1923, lxiv, 289.

A case of eclampsia is reported in which convulsions recurred three days after labor and in which just before the recurrence of the convulsions, jaundice appeared. Such conditions as catarrhal jaundice, cholelithiasis and other forms of obstruction, as well as acute yellow atrophy of the liver, were not present to account for the jaundice. The patient had received chloroform and chloral hydrate which may have been responsible for the icterus. But at the Frankfort Clinic there had been seen five additional eclamptics who had icterus but who had not received chloroform or chloral hydrate. Hence, the author feels the case he reported was one of the rare cases of symptomatic icterus associated with eclampsia and that the chloroform and chloral may have been partly responsible. A hemolytic origin was ruled out by the presence of a hyperbilirubinemia of the undelayed type (Van d. Bergh test) and also by the presence of bilirubin in the urine.

Up to the present time icterus associated with eclampsia was considered a very unfavorable sign. Among the 142 eclamptics which the author studied, 14 showed icterus (10 per cent). Of these, 9 had received chloroform and chloral hydrate and of the 14 cases only 2 died (14.3 per cent). Among the 9 very severe cases of jaundice there was a mortality of 22 per cent, but this was not much higher than the general mortality of all the eclamptics in the author's series which was 19.7 per cent. The author, therefore, concludes that icterus associated with eclampsia does not necessarily make the prognosis worse.

J. P. GREENHILL.

Hirsch, R.: Visual Disturbances in Eclampsia. *Monatsschrift für Geburtshülfe und Gynäkologie*, 1922, lix, 141.

In eclampsia aside from retinitis albuminurica gravidarum, the ophthalmoscope often reveals changes in the eyegrounds such as detachment or edema of the retina, choked disc and inflammation of the choroid. These conditions have a more favorable prognosis in the pregnant woman than in the non-pregnant. In some cases of eclampsia, where there are serious visual disturbances, even total amaurosis, the eyegrounds appear normal. The amaurosis in these cases is due to a disturbance in the visual centers of the brain. Both sides of the brain are affected and there is present a bilateral homonymous homianopsia. If the disturbance is less severe, there is an amblyopia and if only one center is involved there is present a unilateral homonymous hemianopsia.

At the Munich clinic among 538 cases of eclampsia there were 15 patients with total amaurosis and 13 with high grade amblyopia. However had all these eclamptic patients been examined carefully, a greater incidence would have been found. The common history in these cases was as follows: Usually without cause but sometimes after mild disturbances such as headache and nausea, complete blindness set in. In most of the patients the amaurosis preceded convulsions. These visual disturbances occurred during pregnancy as well as during labor and the puerperium.

The duration in the reported cases was from one hour to over three days. All but one case cleared up immediately after delivery or after the last convulsion, hence the prognosis as to vision in these patients is favorable. J. P. GREENHILL.

Hinselmann, Nettekoven, and Silberbach: Capillary Circulation in Eclampsia.
Archiv für Gynäkologie, 1923, cxvi, 443.

This is a minutely detailed report of observations and conclusions incident to the study of the digital capillary circulation in 18 eclamptics. In 16 cases, a graphic time-recording device was used. In every patient, the authors found periods of capillary stasis, in comparison with 80 per cent of previously observed healthy nonpregnant women who showed none, and 40 per cent of healthy pregnant women who showed none. RAMSAY SPILLMAN.

Fitzgibbon: The Relationship of Eclampsia to the Other Toxemias of Pregnancy.
Journal of Obstetrics and Gynaecology of the British Empire, 1922, xxix, 402.

Hyperemesis, accidental hemorrhage, neuritis, the albuminuria of pregnancy and eclampsia are all classed as toxemias of pregnancy. The various names are applied to the dominant symptom but vomiting, paresis, hemorrhage and convulsions are all symptoms of one and the same disease. Albuminuria is the only universal symptom and this varies greatly in intensity.

The age occurrence in eclampsia seems younger than in the other toxemias. Albuminuria of pregnancy and eclampsia are both more common in the primigravida. Toxemias tend to produce symptoms earlier in multiparae than in primigravidae. When a primigravida develops toxemia the tendency to convulsions stands in proportion to her youth. Accidental hemorrhage occurs usually in the multipara and may be associated with convulsions or other toxic symptoms. Headaches occur in 25 per cent of toxemia, hemorrhage and eclampsia. Edema and decreased urinary secretion are usually in direct proportion to the albuminuria.

The pathological findings in toxemia, eclampsia and hemorrhage are identical. A subacute nephritis is common to all. The causes of toxemia may be summed up as an extra demand on the eliminative organs and the failure of these organs to keep pace with the demand. Pregnancy requires a certain reserve power in the eliminative organs. Patients with decreased eliminative powers develop toxemia early in pregnancy. Overeating, neglect, constipation and a rapid gain in weight are all common symptoms in toxemic women. The maintenance of regular bowel action avoids toxic accumulation and delays excretory decompensation.

The treatment of the toxemias of pregnancy as carried out at the Rotunda is based entirely on elimination and varies only with the immediate urgency of the symptoms. Starvation, purgation and diuresis are employed in all cases. Labor is induced only after the failure of medical treatment. Where vomiting is a pronounced symptom, nothing is given by mouth and fluids are supplied by submammary infusion and enemata. Morphine helps in this type of cases. The routine in eclampsia includes stomach lavage and catharsis, long continued colonic irrigations every five hours, and the eliminative measures employed in all toxemias. All unconscious patients are kept continually on the side and the respiratory passages must be kept free of mucus. Morphine though employed freely some time ago is no longer used routinely in all cases. Labor is not interfered with until the fetal head reaches the perineum. The methods advocated or their modifications are the only ones as yet capable of showing a mortality in eclampsia of less than ten per cent. H. W. SHUTTER.

Eden: Eclampsia. A Commentary on the Report presented to the British Congress of Obstetrics and Gynaecology, June 29, 1922. *Journal of Obstetrics and Gynaecology of the British Empire*, 1922, xxix, 386.

There are about six hundred deaths from eclampsia in Great Britain and Ireland each year. From an average mortality of 22.5 per cent Eden estimates the incidence of eclampsia to be about three thousand cases per annum. The highest maternal mortality reported was 25.1 per cent for 302 cases from the Midland Counties, the lowest was 10.19 per cent for 204 cases in Dublin. An average maternal mortality of 27.4 per cent in multiparae shows that the disease though less common is more virulent than in primigravidae. Eclampsia is from four to five times more common in twin pregnancies. Premonitory symptoms occurred in 84.7 per cent of cases. Cases without premonitory symptoms are not more severe than the others. The percentage of eclampsia occurring before the thirty-sixth week varied from 22 per cent in Edinburgh to 44 per cent in London. Among infants, prematurity probably accounts for more deaths than the toxemia itself. Narcotics administered to the mother, the methods employed in delivery and the deprivation of breast milk are additional factors responsible for the high fetal and infant death rates.

A study of symptomatology in 706 cases showed the following phenomena to be signs of danger and their presence or absence is used as a basis of classification: (1) coma, (2) pulse rate over 120, (3) temperature above 103, (4) a number of fits greater than ten, (5) urine which becomes solid on boiling, (6) the presence of edema and (7) blood pressure above 200 mm. Any case showing two or more of the phenomena was considered severe, all others were classified as mild. The mortality in cases without coma was 5.7 per cent. In the presence of deep coma 54 per cent of patients died. Thirteen per cent of cases with a pulse rate under 120 but 38 per cent of those with a pulse rate above 120, died. When the temperature rose above 103° the mortality was 75.6 per cent. Blood pressure above 200 mm. is accompanied by a mortality several points over the average. In a series of 1051 cases, those recovering had an average of 6.7 fits, those dying averaged 11.8 fits. A mortality of 13 per cent occurred in cases with only a trace of albumin as against 29.7 per cent when the urine boiled solid. Twenty-four per cent of patients died when eclampsia developed before the 36th week, 19.3 per cent after.

A study of the results from the different modes of treatment is interesting. The cases were classified as mild or severe. Results show that natural delivery, assisted delivery or induced labor yield results twice as favorable as those following cesarean section. Accouchment forcée both in cases classified as mild and severe carried a mortality from two to five times higher than similar cases handled by the more conservative measures. Accouchment forcée no longer has a place in the treatment of eclampsia. Delivery brought about a cessation of convulsions in three out of every four cases. The maternal mortality was not necessarily higher when convulsions continued after labor.

The author concludes that eclampsia is preventable and prophylaxis is the best treatment. All eclampsia should be treated in hospitals. A standard classification of cases according to symptomatology will make clinical records more valuable and facilitate treatment. All cases of eclampsia whether mild or severe are best treated with a minimum of obstetric interference. Simple conservative medical treatment carefully regulated and closely watched gives the best results. The lines laid down by Stroganoff and Tweedy are the best available to date. H. W. SHUTTER.

Harris, John W.: The Aftereffects of the Late Toxemias of Pregnancy. *Bulletin of the Johns Hopkins Hospital*, 1924, xxxv, 103.

From his study of the subject, the author draws the following conclusions: 1.

While no recurrences of eclampsia occurred in our series, the fact that three of the twenty-seven eclamptic patients who were seen one year later showed evidences of chronic nephritis indicates that the danger of permanent renal damage following eclampsia is not to be disregarded. 2. The danger of chronic nephritis following pre-eclamptic toxemia is unexpectedly great, as shown by the fact that 60 per cent of our patients whose pregnancies were complicated by pre-eclamptic toxemia showed evidences of chronic renal disease when examined one year later. 3. We are unable to differentiate between the cases of pre-eclamptic toxemia which will be followed by chronic nephritis and those which will not result in permanent renal injury. It is possible that the duration of the symptoms of the toxemia before delivery may be an important factor. 4. If, in supposed cases of pre-eclamptic toxemia, the evidences of the toxemia persist for three weeks or more after delivery, the presumption is that the underlying disease is renal in origin.

The author plans to continue this investigation, supplementing it with more elaborate metabolic tests, especially with chemical studies of the blood and urine.

C. O. MALAND.

Stroganoff: My Improved Method of the Prophylactic Treatment of Eclampsia.

The Journal of Obstetrics and Gynaecology of the British Empire, 1923, xxx, 1.

Eclampsia is the result of a reciprocal action between a toxin circulating in the mother's blood and the resulting irritability of the central nervous system. Associated with the convulsion are a temporary asphyxia and cardiac dilatation, an increase in the nervous irritability and a depression of kidney secretion. The general muscular contraction during each convulsion increases the amount of toxin thrown into the system, weakens the organism and hastens the fatal outcome. To successfully treat eclampsia, one must control convulsions, lessen the concentration of toxin in the system and reduce the irritability of the central nervous system. This is done best by the conservative method of treatment. The author's method is carried out as follows: On admission the patient, if conscious, is chloroformed while a careful internal examination is made. Catheterization is performed and an enema given if necessary. Morphine hydrochloride (0.015 gm.) is given. One hour after the first injection of morphine 1.5-2.5 gm. of chloralhydrate are administered per rectum in 200-230 c.c. of saline solution. This is repeated in six, twelve and twenty-one hours after the first injection. No manipulations such as injections, internal examinations or the administration of enemata are carried out until the patient has received a small amount of chloroform to reduce the nervous irritability. Should delivery occur, chloroform is administered during the passage of the head over the perineum. Drug dosage is at all times controlled by the patient's condition. When conscious she is urged to drink milk. Delivery is not hastened except when it can be effected by the simplest operative measures. Digitalis, camphor, etc., are given on the first signs of cardiac weakness (pulse of over 110, etc.). Venesection (small amounts, 400 c.c. or less) is practiced when fits continue or blood pressure remains high in spite of treatment. The respiratory passages are kept clear at all times and kidney and skin elimination are encouraged by gentle local heat. Fluids are administered by mouth or rectum only. Should prodromata of convulsions return, chloroform or chloralhydrate is administered. Convulsions do the patient far more harm than continued drug administration. Insufficient drug administration at the onset of treatment is the most common cause of failure with this method of treatment.

In the treatment of pre-eclamptic toxemia the author advocates rest in bed, a reduced diet, (milk) and narcotics in small doses. If the condition does not improve, if casts appear in the urine, or there is an increase in the amount of albumin, labor is induced by the simplest method possible.

Stroganoff's method (or its modifications) has been applied to 2208 cases of eclampsia in 39 European clinics with a maternal mortality of 9.8 per cent. In one hospital 78 cases were personally treated by Stroganoff without a fatality. The method yields an average infant mortality of 18.5 per cent. The author feels that greater familiarity with the method and attention to the details of its execution will materially improve the remarkable results already obtained. II. W. SHUTTER.

Costa, N. P.: One Hundred Cases of Eclampsia Treated by the Method of Stroganoff. *Semana Medica*, 1922, xxix, 1023.

One hundred cases of eclampsia with one to 42 convulsions are summarized by the writer, seventy-four were treated by the Stroganoff method, while in 26 veno-section also was resorted to. The cases were all isolated in a blue room, in order to procure the quieting effect of blue light upon the nervous system. All operative interventions took place in these surroundings, and the patient was not removed until well along in convalescence. Twenty operations were performed, all by the pelvic route, and all, save for two vaginal cesareans in cases with repeated convulsions, after complete or practically complete dilatation and in the expulsive stage, twenty cases died, a mortality of 20 per cent.

Seventy-eight cases delivered of 82 fetuses, (4 twins), resulted in 34 stillbirths, a gross fetal mortality of 39 per cent; of these, however, 14 were dead on admission, and 12 were non-viable, a corrected mortality of 10 per cent.

Despite the admittedly high mortality of the series, due to the seriousness of the cases admitted to the clinic, (the majority in coma), the author believes that the Stroganoff treatment is superior to most of the medical treatments of eclampsia, and that it will in many cases permit the patient to be carried along, if not to term, at least to the period of viability of the child. In general it is a valuable method for the practising physician anywhere, and is an effective means of combating the most dangerous symptom, the eclamptic seizure. THOS. R. GOETHALS.

Zweifel, Erwin: On Eclampsia. *Muenchener Medizinische Wochenschrift*, 1923, lxx, 977.

Experiments by the writer on pregnant and nonpregnant rabbits and guinea pigs with injections of serum of their own fetuses showed entirely negative results. They contradict the results of Lockemann, Thies and Graefenberg who had reported anaphylactic reactions from such experiments. Zweifel ascribes the difference of results to the use of comparatively too large quantities of serum injected by other investigators. Discussing the methods of prophylaxis and therapy of the clinic at Munich he advocates conservation. Edemas of pregnancy in the pre-eclamptic stage are treated by means of forced perspiration, decrease of fluid-intake, a salt-free diet and diuretics. Cases with involved kidneys are treated as nephritics. Convulsions are handled with venesection and narcotics (morphino and chloralhydrate or luminalnatrium and magnes. glycerino-phosph.). Operative measures were only used when conservative methods had proved inefficient. Statistics of the Munich clinic show from Jan. 1, 1913, to Dec. 31, 1921, among 29,733 deliveries 190 eclampsias (145 primiparae and 45 multiparae), of these 23 died (17.39 per cent), 7 of them of aspiration-pneumonia. Cases delivered spontaneously or with low forceps showed a mortality only of 7 per cent (eclampsia of pregnancy 10 per cent, eclampsia of labor 6 per cent, eclampsia of puerperium 5 per cent). For this reason the writer advocates conservative treatment, reserving operation solely for the cases in which convulsions continue in spite of treatment. GROVER LIESE.

Solomons, Bethel: The Treatment of Eclampsia by the Dublin Method. The Clinical Journal (London), 1922, li, 601.

The treatment insisted upon consists of starvation, nothing but water being allowed on the ground that the fetal toxin takes something from the blood intended for use in the digestion of food. Stomach lavage is continued until the return is clear and then two ounces of concentrated magnesium sulphate are left in the stomach. Bowel lavage is employed until the return is clear, soda bicarbonate is the agent employed. Morphia may or may not be used. Sodium bicarbonate, one drachm to the pint should be injected routinely in all cases. The patient should be carefully watched because many of them drown in their own mucus due to negligence on the part of the attendant. The uncertainty of prognosis is demonstrated by the fact that one woman had a hundred convulsions and recovered while another had only one convulsion and died. January, February and March together with September seem to be the usual months of occurrence. In 204 cases of eclampsia the death rate was 10.29 and this rate, compared with the death rate under other treatment, is sufficient argument for the so-called Dublin Method.

A. C. WILLIAMSON.

Engelmann, F.: Further Contributions on the Question of Eclampsia. Monatschrift für Geburtshilfe und Gynäkologie, 1923, lxii, 187.

The author reports his last 59 cases of eclampsia. There was a maternal mortality of 10 per cent and approximately 90 per cent of all the children were born alive. The best treatment is careful, active prophylaxis and after convulsions have occurred, the treatment must be individual. Venesection is of the greatest importance and its efficacy is doubled or trebled when combined with infusion. Venesection not only reduces the blood pressure and relieves the heart, but also diminishes the viscosity of the blood and reduces the body temperature.

Labor should be hastened preferably by rupture of the membranes. In only 10 per cent of the cases was it necessary to resort to operative procedures so that 90 per cent of both mothers and children were saved without operative interference. Prodromal symptoms were present in all but 2 out of 223 cases of eclampsia which have come under the author's observation. Hence it is practically always possible to take prophylactic measures.

The author claims that the rest-nitrogen is not increased, the blood coagulates quicker than that of normally pregnant women or women in labor, the blood platelets are markedly reduced in number, and the blood possesses a higher viscosity than normally. Venesection reduces the viscosity 17 per cent, and infusion of sodium chlorido reduces it 25 per cent. The combination of venesection and infusion reduces the viscosity 33 per cent.

The important factors in the therapy are hastening of labor through rupture of the membranes, delivery without force as soon as possible, venesection of 500-600 c.c., infusion of sodium chloride, administration of chloral, luminal and pantopon. To reduce the maternal mortality, treatment must be begun before the convulsions occur or immediately after the first one.

J. P. GREENHILL.

Stevens: The Treatment of Eclampsia by Veratrum Viride. Journal of Obstetrics and Gynaecology of the British Empire, 1922, xxix, 426.

The author does not use veratrum in a purely expectant manner. The treatment advocated is the injection of one cubic centimeter of veratrum viride at the first opportunity. This is accompanied by the rupture of the bag of waters and the introduction of a dilating bag for cases not in labor. The drug produces a rapid fall both in blood pressure and pulse rate. Radical operative interference is

avoided as far as possible. Nareotics, venesection and saline infusion are not employed. Bowel lavage and purgation are useful but one is not justified in using the stomach tube to give the latter.

The drug is dangerous except in actual eclampsia with convulsions and high blood pressure. The dose may be reduced for small women. Forty-four per cent of twenty-five cases had no convulsions after the injection and 66 per cent had no fits after veratrone and delivery. Four cases died, a mortality of 16 per cent. One case died four days after convulsions had been controlled by veratrone. All five postpartum eclamptics recovered but there was little response to the drug in these cases. The advantage of conservatism is apparent as the four deaths in the series occurred where accouchement forcé and cesarean section supplemented the use of veratrone.

H. W. SHUTTER.

Bourne: A Case of Eclampsia Illustrating the Use of Veratrone. *Journal of Obstetrics and Gynaecology of the British Empire*, 1922, xxix, 432.

The dosage of the drug must be controlled by blood pressure and pulse rate observations. Veratrone is not employed where the blood pressure is below 140 mm. or where the pulse rate is below ninety-six. Bourne advocates a graduated dose of one c.c. in cases with a blood pressure above 190 mm. and descending to 0.25 c.c. where the pressure is between 140 and 155 mm. After a large dose there may be a fall in blood pressure as great as 100 mm. The action of the drug is temporary and there is an effort made by graduated doses to keep the blood pressure around normal. Careful observation with frequent blood pressure and pulse rate determinations are necessary if the use of veratrone is to be successful.

H. W. SHUTTER.

Hingston and Mudaliar: Gleanings from the Records of the Government Maternity Hospital, Madras. *India Medical Gazette*, 1923, lviii, 379.

The writers give an analysis of 459 cases of eclampsia covering a period of fourteen years. During this period 33,300 cases were admitted, an incidence of 1.38 per cent. Seventy-two per cent were primiparae and 70 per cent occurred below the age of 20, due to the early incidence of pregnancy in Indian women. Seventy per cent occurred in women at or near full term and no case before the sixth month. Albumin was absent throughout in 13.29 per cent; average number of fits was 6.3 per cent. Marked mental derangement was noted in 5.67 per cent. Mortality was 17.64 per cent, and this is greatest intrapartum. The morality was 12.67 per cent in those allowed to have natural delivery and 20 per cent in the aided cases. So far as labor is concerned no attempt at accouchement forcé is permitted and all that the obstetrician is allowed to do is to terminate the second stage of labor as soon as possible if all conditions for artificial delivery are favorable. Fifty-four per cent of live births were obtained.

High blood pressure generally leads to a succession of fits and is the most fruitful cause of complications, particularly hyperpyrexia, edema of the lungs and bronchopneumonia. The essence of treatment, therefore, consists in reducing the blood pressure to 110 mm. or below and keeping it reduced. This is done with hypodermic injections of veratron (P. D. & Co.) since 1922. Prior to this venesection was employed removing 12 to 24 ounces of blood. Morphine is used for the fits, repeated as often as needed. Magnesium sulphate is given by mouth if possible and bowel wash is used. In cases of severe collapse, saline and glucose are administered per rectum every two hours.

F. J. SOUBA.

Books Received

NATIONAL HEALTH SERIES. Volumes 14th to 20th:

ADOLESCENCE; EDUCATIONAL AND HYGIENIC PROBLEMS. By Maurice A. Biglow, Ph.D.

EXERCISES FOR HEALTH. By Lenna L. Meanes, M.D.

THE CHILD IN SCHOOL; CARE OF ITS HEALTH. By Thomas D. Wood, M.D.

THE HEALTH OF THE WORKER; HOW TO SAFEGUARD IT. By Lee K. Frankel, Ph.D.

HOME CARE OF THE SICK. By Clara D. Noyes, R.N.

YOUR MIND AND YOU; MENTAL HEALTH. By George K. Pratt, M.D.
Published by Funk and Wagnalls Company, New York City.

PRINCIPLES AND PRACTICE OF OBSTETRICS. By Joseph DeLee, A.M., M.D., Professor of Obstetrics at the Northwestern University Medical School, Obstetrician to the Chicago Lying-in Hospital and Dispensary, and to Mercy Hospital, etc. With 1128 illustrations on 923 figures, 201 of them in colors. Fourth edition, thoroughly revised. W. B. Saunders Company, Philadelphia, 1924.

MEDICAL GYNECOLOGY. By Samuel Wyllis Bandler, M.D., Fellow of the American Association of Obstetricians and Gynecologists; Professor of Gynecology, New York Post-Graduate Medical School and Hospital, etc. Fourth Edition. With original illustrations. W. B. Saunders Company, Philadelphia, 1924.

RACE HYGIENE AND HEREDITY. By Hermann W. Siemens, M.D. Translated and edited by Lewellys F. Barker, M.D. Illustrated. D. Appleton and Company, New York, 1924.

TRAVAUX PRATIQUES D'ANATOMIE PATHOLOGIQUE. Quatorze séances de lectures de coupes microscopiques. Par Gustave Roussy, et Ivan Bertrand. Préface du professeur Pierre Marie. Troisième édition. Masson et Cie, Editerus, Paris, 1924.

PRECIS DE PATHOLOGIE CHIRURGICALE. Tome III. Glandes mammaires, abdomen, appareil génital de l'homme. Par Pierre Duval, E. Jeanbrau, A. Gosset, P. Lecene et Ch. Lenormant. Quatrième édition. Masson et Cie, Editerus, Paris, 1924.

DIE RAUCHENDE FRAU. Eine klinische, psychologische und soziale Studie. Von Dr. R. Hofstaetter, Privatdozent fuer Geburtshilfe und Gynaekologie in Wien. Verlag von Holder-Pichler-Tempsky. Wien-Leipzig. 1924.

BIOLOGIE UND THERAPIE DES WEIBES. Herausgegeben von Josef Halban, Wien, und Ludwig Seitz, Frankfurt a.M. Lieferung 9. Urban und Schwarzenberg, Berlin und Wien, 1924.

The American Journal of Obstetrics and Gynecology

VOL. VIII

ST. LOUIS, NOVEMBER, 1924

No. 5

Original Communications

MILK INJECTIONS IN GYNECOLOGY AND OBSTETRICS*

BY GEORGE GELLHORN, M.D., F.A.C.S., ST. LOUIS, MO.

(From the Department of Gynecology and Obstetrics, St. Louis University School of Medicine)

ALL activities of the normal cell are produced by stimuli. The same is true if the cell is in an abnormal state. "Disease," says Verworn,¹ "is simply response to stimulation. Disease is life under altered vital conditions, and altered vital conditions are stimuli."

Generally speaking, stimuli are either excitants or depressants. Harmful, i. e., disease producing stimuli, whether of bacterial origin or toxic, traumatic, thermic, chemical or photic in nature, usually depress cell function at once; less often does the stage of depression follow one of excitation.² In either event the cell reacts with various defensive measures and exhibits, as Petersen⁴ puts it, a consistent effort to dilute the noxious agent, to remove it by intracellular or extracellular digestion, to neutralize it; these failing, then to wall it off, to put it outside of the current of normal tissue activity.

This process characterizes the "acute" stage of any disease. In the subacute stage, the outcome still hangs in the balance, and restitution will depend on the ability of the cell to throw off its enemy. The transition into the chronic stage means that the cell is about to lose this chance.

Such a fatigued cell, however, may yet recover its normal function if it receives a quickening ("exciting") stimulus before it is completely exhausted. Dolley³ has actually demonstrated the various morphologic changes through which a pathologically altered cell passes

*Read at the Forty-ninth Annual meeting of the American Gynecological Society, Hot Springs, Va., May 15-17, 1924.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

in its recovery until it again attains its original form and with it its original function.

It is this possibility of recharging the cell with energy which is the basis of the protein therapy. For it has been found,—empirically at first, but later amply confirmed by laboratory investigation,—that protein substances if introduced “parenterally,” that is, by subcutaneous, intravenous or intramuscular injection, have the faculty of stimulating the cells of the body to greater activity—of “activating the protoplasm.”

We know many beneficial cell stimuli—fresh air, for example, sunlight, water in various forms of application, heat in moderate degrees and other means of producing hyperemia, etc.—but none of them is probably as powerful as the parenteral administration of proteins which exerts its influence upon *all* cells of the body. In addition to this “omnicellular” effect, there is an even more marked impress made upon those cells which have been weakened or paralyzed by disease. This is, after all, not very surprising since we have learned from physiologic researches that any cell previously involved, let us say, in an inflammatory process, responds to stimuli of all kinds more readily than a normal cell.⁴

Whatever the explanation of this interesting phenomenon, it will suffice for our present purposes to appreciate the fact that by the reviving stimulus of the protein injections, the affected cells are rescued from bondage, as it were; some of their normal vigor returns, and their natural means of defense become reassembled. They are now in a position to renew the struggle against the invading microbes which represent the vast majority of causes of disease. The protoplasm again develops phagocytic properties, the toxins are neutralized by a fresh production of antibodies and ferments, the local metabolism is intensified, and the pus is absorbed. Under favorable circumstances, the infected organ or tissue may thus rid itself of its enemy, and more or less normal conditions may be reestablished.

The fascinating story of how this knowledge has been acquired in the last eight or nine years, is very interestingly told in Petersen's admirable book. Only this much must be said here that the protein therapy grew out of the immunizing and curative treatment with sera and vaccines which has prevailed in medical science for the last thirty years. But whereas the basic principle had heretofore been that the organism in its resistance to disease and defense against bacterial invasion must be supported by essentially *specific* means, the protein therapy rests upon a *nonspecific* basis. In other words, it is now a definitely established fact that many infectious diseases can be cured by the introduction into the body of nonspecific substances which in themselves, have no relation whatever to the infection under treatment.

If we apply this conception of the action of protein therapy to our special field, we may, as a familiar example, picture to ourselves an inflamed and swollen, and even an occluded and distended tube taking up an invisible warfare against the gonococci and their products. If the affected cells had become sufficiently stimulated and strengthened and if at the same time the original virulence of the infecting microbes had somewhat abated, the tube may emerge victorious from the struggle, with the gonococci destroyed, the pus absorbed, and the tissues of the tube normal or fairly normal in size and softness.

Puerperal sepsis may serve as a second example. Here where the entire body is being inundated from the original site of the infection, the defensive powers of the organism mobilized by the protein injection, may succeed in eliminating the disease altogether or, at least, in localizing it at its primary focus where it would be accessible to surgical treatment.

It stands to reason that only those cells can take up the fight for existence with any prospect of success that have not been hopelessly and permanently damaged, and as a matter of fact, practical experience has shown that protein therapy gives a greater promise of cure the earlier in the course of the disease the treatment is instituted.

There are involved in this process intricate and complicated biologic and morphologic problems, some of which are as yet imperfectly understood, while others are sufficiently classified. I refer to Weichardt, Von den Velden, Döllken, Jobling and Petersen, Luithlen, Starkenstein and numerous others⁵ who have accurately studied the increased vasomotor and glandular activity, the variations in the nitrogen metabolism and the permeability of the blood vessels, the increase in the amount of blood sugar, fibrinogen and thrombokinase, and many other phenomena which follow the injection of proteins.

Aside from these changes within the organism there are certain well-defined outward manifestations which are observed by the clinician. These appear in the form of the so-called general reaction consisting in most cases of chills and more or less high fever, in others merely in a very slight rise of temperature accompanied by nausea, headache, perspiration or a vague malaise; complete absence of this general response is rather rare. The rate of pulse and respiration is but little affected, but there is always a transitory hyperleucocytosis. After intramuscular injection the general reaction is, as a rule, much less stormy than after intravenous administration and shows, moreover, a tendency to grow progressively less after succeeding injections. In addition to these constitutional manifestations there is also a "focal" reaction in the affected part which while probably present in all cases, evidences itself only now and then by increased pain and swelling of the inflammatory tumor, both of which, however, are of very short duration.

Both Petersen⁴ and Lindig⁶ present extensive lists of protein substances which have been used for therapeutic or experimental purposes. Among these may be mentioned: normal blood (human, horse, sheep, beef, goat, chicken, etc.) and immune sera (antistreptococcus, antimeningococcus, human convalescent, etc.); antitoxins (diphtheria, tetanus); cerebrospinal and pleural fluid; egg albumin and serum albumin; milk; casein; nucleoprotein; peptone; leukocytic extract; extracts of tissues (cartilage, etc.) and of endocrine glands; vaccines of all kinds; tuberculin; Coley's fluid, colloidal metals (collargol). There are also several nonprotein substances, such as turpentine, which have been injected for the same purpose of plasma activation; these produce local destruction of tissue within the reach of the injected agent; the cell detritus is reabsorbed into the organism and now acts as a foreign protein.

For practical purposes only a few of these numerous agents need be considered. Of these, milk is probably the most extensively used at present. Robert Schmidt, of Prague, who introduced it in 1916, selected it because it was always available, even in the remotest village, and because its source, the organism of the cow, seemed to him as reliable as any chemical laboratory.⁷

Milk is sterilized by pasteurization, in the autoclave, or by boiling in a water-bath for ten minutes. The last-named method is the simplest in general practice, unless one prefers the sterile pharmaceutical milk preparations which are marketed in ampoules under various trade names (Aolan, Albusol, etc.). The results are more or less the same whatever form of milk one uses, and this holds also true of the casein, of which Lindig⁸ who inaugurated the casein therapy, claims that it represents the potent factor in the milk. Casein is likewise supplied in sterile ampoules (casein, caseosan) and is administered intravenously in very small doses.

With the exception of a few Aolan injections, my personal experiences were obtained altogether with whole milk. In the beginning I used only certified milk but later injected ordinary hospital milk with equally good results. Indeed, Barkan and Nelson¹⁰ believe that milk with a high bacterial count is more efficacious because of its contents of bacterial proteins.

The site of injection is, preferably, the gluteal musculature, and if the needle is thin and sharp and the injection is made slowly, the procedure is not painful though the bulk of the fluid injected may cause a momentary discomfort. Sensitive infiltrations need not be anticipated as after mercury injections, nor have I ever observed an abscess formation.

The initial dose is 5 c.c., occasionally even less if the patient is very weak or the fever very high, also whenever any of the special conditions to be mentioned later among the contraindications, de-

mand caution. The standard dose is 10 c.c. which, depending on individual circumstances, is reached with the second or third injection and then maintained through the course of treatment. The interval between injections is, as a rule, from three to five days according to the intensity of the reaction; in indolent patients it may occasionally be reduced to two days.

In mild cases, one or two injections will often suffice; in others, more are required. The average number in my cases was about six. In puerperal infections, von Jasehke advises to continue the treatment until the fever has definitely disappeared. Kleebblatt⁹ attempts to determine the question of dosage and interval by repeated blood studies, but in general practice the intensity of reaction and clinical judgment of the patient's resistance will be sufficient guides. There must be a certain limit to the number of protein injections lest they produce "protein cachexia," because excessive or protracted stimulation in itself must eventually lead to fatigue and exhaustion of the cells. Fortunately, this condition has thus far been observed only in animal experimentation.

The general reaction occurred in my cases, as a rule, from six to eight hours after the treatment. The fever following the chill was, in the majority of instances, of moderate degree though occasionally it rose to 103° and 104° and once even reached 105°. However, as pointed out in previous publications,¹² the reaction assumed much milder forms in almost half of the cases. The intensity of the initial reaction which, in my experience, decreases after succeeding injections, is rather generally considered a favorable prognostic sign unless it be excessive, but I have had several most satisfactory results where there was hardly any general reaction.

In any event, the general condition is affected but a very short time, twenty-four hours at most, after which the euphoria, which is mentioned by all writers, is quite marked. The patients look and feel decidedly better and their appetite is improved. Systematic white blood counts revealed a hyperleucocytosis on an average of 20,000 to 25,000 on the day following the injection, which receded to more normal figures within the next two days. I have not observed excessive degrees of 40,000 such as Petersen mentions. The behavior of the leucocytes depends, of course, on the original leucocytosis and the general state of the patient.

The focal reaction in my cases was, on the whole, insignificant. In a few of the gonorrheal patients I have observed an increase of pain and adnexal swelling which gave way to subjective and objective improvement after from two to four injections.

An anaphylactic shock has never occurred in my cases nor need it be anticipated. While this alarming complication has repeatedly been observed after intravenous injections of casein, only three such

eases have been reported among the many thousands of intramuscular injections of milk.¹¹ It may be that in these cases part of the injection had accidentally reached a vein, and I make it a point to test, before each injection, whether the needle has punctured a vessel.

The principal field for protein therapy in gynecology is in the treatment of pelvic infections, particularly those of gonorrheal origin. Usually, a marked subjective improvement follows promptly after one or two injections and is but rarely delayed until after the third or fourth treatment. It is this very relief from pain which makes it so difficult to keep our clinical patients who are wage earners and anxious to return to work, in the hospital long enough to obtain the corresponding objective results. When the patient remains under sufficient treatment, the steady diminution and eventual disappearance of the adnexal tumors may well be observed in favorable cases. Other things being equal, such a gratifying outcome is more often accomplished in private patients. A case in point is the following:

CASE 1. Mrs. F., twenty-eight years old, patient of Dr. C. E. Burford. Gonorrheal infection three weeks ago (gonococci in cervical smear). Ascending gonorrhea followed menstruation a week ago. Local peritonitis and large bilateral pyosalpinx, practically unaffected by the usual conservative measures. Transfer to hospital. Seven milk injections, combined after some time with protracted hot douches and dry heat, brought about a *complete* cure, both objective and subjective, in five weeks, which has now continued for two and a half years.

This case, which represents the subacute type of infection, offers two very interesting points. To begin with, there was at no time a general reaction other than drowsiness, and no focal reaction whatever. Secondly, in this case the cervical gonorrhea healed without any local treatment. Smears from urethra and cervix made at intervals for four months, were free from bacteria and pus cells. I have had but one other case of this sort. In all the rest, the injections did not affect the gonorrheal foci in cervix and urethra, and this seems to have been the experience of other writers on the subject.

The effect of milk injections in chronic recurrent adnexal infection is illustrated by the following case:

CASE 2. Mrs. R., aged thirty-seven, patient of Dr. B. F. Striegel. Recurrent attacks of abdominal pain. Present attack has lasted for almost six weeks and is growing worse (pyrexia, meteorism, menorrhagia, etc.). Very large bilateral pyosalpinx and diffuse edema of pelvic cellular tissue. Nine milk injections, the second injection followed by marked focal reaction, were given within twenty days and combined with protracted hot douches. Subjective well being ensued promptly. Both adnexa became normal. A flat, hard exudate on anterior surface of sacrum remained.

Six months later recurrence of old symptoms, this time with formation of a large exudate which fills entire pelvis and extends upward to within two fingers' width of umbilicus. Again sent to hospital and treated with milk injections, hot douches, and dry heat. The fever disappeared after the third injection, the exudate

after the ninth. Both tubes are now found thickened but painless, and the subjective well-being has, at present writing, persisted for four months.

The chronicity of the infection in this case was a rather severe test for protein therapy; yet, the milk injections yielded a very satisfactory result though they could not forestall a recurrence. The condition was clearly unsuited for operation during both attacks, but I feel that now the best course to pursue would be a panhysterectomy to which, however, the patient raises objections.

With our floating clinical material it is difficult to obtain statistical data. Among my first ten patients with frank gonorrhea, there were six cures, two improvements, and two failures.¹² If I had been able to keep track of a larger number of patients, the percentage of cure would probably have decreased. Even then, the fact that a considerable number of these patients can be cured without a mutilating operation, stamps the protein therapy as one of the most important advances of modern medicine. Trossarello's¹³ results in 20 cases of gonorrheal adnexitis surpassed those obtained with specific vaccines or anti-serums. Stegemann¹⁴ saw in 30 cases treated with milk 20 per cent cure, 50 per cent improvement, and 30 per cent failure. He contrasts these results with those obtained from the usual conservative methods, namely, rest in bed, hot fomentations or dry heat, whereby he observed in 70 cases cure in 18.6 per cent, improvement in 51.4 per cent and failure in 30 per cent. The logical conclusion is to combine the milk injections with other tried forms of treatment.

Of other venereal affections which are favorably influenced by protein therapy, the successes of Gärtner¹⁵ in the treatment of chronic inflammations of Bartholin's glands may be mentioned. Numerous reports testify also to the effect of milk injections in buboes; in most of the cases the injections practically aborted the lesions.¹⁶

I have observed an equally rapid result, from one injection, in three instances of nonspecific boils about the genitals; in one case, a second abscess appeared two or three weeks later and required one more injection.

Von Jasehke¹⁷ praises the success of protein injections in genital and peritoneal tuberculosis. "Hyperpyretic and extremely sick patients became afebrile, sometimes after only three injections, and felt so much improved that they could barely be kept in bed."

A mixed infection was probably the etiology in the following two cases.

CASE 3. Mrs. M., thirty-one years old, has introduced into her own uterus a slippery elm tent in the mistaken idea that she was pregnant. Admitted to hospital on Oct. 27, 1921, with chills, fever of 104°, pulse 120, leucocytes 23,800. Mass size of man's fist in right pelvic half, rapidly growing larger, bulging into culdesac, fluctuating. Seven milk injections sufficed, without any other treatment, to bring about a complete absorption of the acute exudate. Two months later she was back at work and has remained well ever since.

CASE 4. Mrs. B., aged twenty-one years, patient of Dr. F. C. Bram, had a curettage, five weeks after delivery, for retained placental tissue. Perforation of uterus, recognized immediately and treated with suitable conservative means. Fever commenced three days later, and within a week a fluctuating tumor developed behind the uterus which extended upward almost to the umbilicus and bulged deeply into the culdesac. After five milk injections every trace of this mass had disappeared in eighteen days, and the patient has remained perfectly well for more than two years.

In yet another patient, the pelvic tumor was of an entirely obscure origin. She had a severe cystitis, and with each micturition large quantities of air escaped from the bladder. The cause of this phenomenon could not be ascertained. Her very poor general condition permitted of no exploratory operation, and she was given milk injections to build up her general resistance. The result was very satisfactory; the cystitis improved markedly, and the escape of air ceased; in fact, the patient felt so completely restored after about three weeks that she refused operation.

I have repeatedly injected milk in weakened patients, particularly those with uterine cancer, to prepare them better for the strain of an operation. In postoperative complications such as disturbances of wound healing I have used the milk treatment a few times but the results were not conclusive; in one case of postoperative pneumonia, on the other hand, two milk injections cleared up the condition very promptly.

There was, finally, a case with a very unusual indication where milk injections yielded a wholly unexpected result.

CASE 5.—This patient had received radium treatment for an inoperable cancer of the cervix. The subsequent shrinkage of the tumor masses and the formation of cicatricial tissue obliterated the cervical canal and there ensued a pyometra which within a few weeks extended as high as the umbilicus. I tried to open up and drain the uterine cavity but the dense mass of scar tissue defied my attempts. I then put the patient on the milk treatment merely in the hope of ameliorating her desolate general condition. Much to my surprise, the uterus grew steadily smaller and after twelve injections was practically of normal size. Simultaneously the appearance of the patient and her subjective condition were those of a healthy person, and this improvement continued to within a short time of her death, two months later.

In closing the chapter on protein therapy in gynecology, it may be well to state that not all parts of the genital tract respond equally well to milk injections. The tubes, the uterus, and probably the bladder, are favorably influenced while the ovaries seem to remain refractory. Exudates are brought to absorption, or else a circumscribed suppuration is hastened so that they can be attacked surgically. Adhesions are not affected. Gonorrheal infection of the cervix, as a rule, remains likewise untouched by the treatment, and so are gonorrheal foci in the urethra and rectum. These, therefore, must be treated separately to prevent reinfection.

In obstetrics, protein therapy has yielded to the majority of the writers most satisfactory results in various forms of puerperal infection. Even those who, like Doederlein,¹⁸ are still somewhat skeptical, would consider it a mistake to omit this means of treatment. Of course, it is a difficult matter to gauge correctly the connection between cause and effect, because there is no way of telling whether the patient in a given case might not have recovered without protein injections. Yet, it is the alpha and the omega of medical wisdom that the outcome in puerperal sepsis depends altogether on the power of resistance of the organism; and there is no doubt in anybody's mind, despite all the gaps in our knowledge, that protein injections immensely enhance this power of resistance. An attempt to tabulate the effect of this therapy was made by Simon¹⁹ who injected milk in thirty cases of febrile abortion and found that the average duration of the fever was from one to two days shorter than in the cases not treated in this manner. This author also records 24 cures in 26 cases of outspoken puerperal sepsis and recommends a combination of ergot and milk: the contractions produced by the former in the flabby, infected uterine musculature close open vessels and prevent, mechanically, the entrance of bacteria and toxins, while the foreign protein stimulates the cells to do away with the microbes.

The considerable number of cases reported from several of the leading clinics on the Continent proves convincingly that the favorable alteration of puerperal infections by protein injection is not merely a matter of coincidence. To be sure, there are a good many failures in this class of cases. This is to be expected if the treatment was not begun early enough. After the entire organism has been inundated with the infectious agents and the cells of the body have been completely exhausted, no amount of stimulation can avail. It is, therefore, essential, as von Jasehke²⁰ and Lindig⁶ point out, to commence the treatment as early as possible and to subject any and every puerpera to protein injection as soon as fever occurs.

My own experiences coincide closely with those recorded in literature. In mild infections, a single injection would sometimes turn the tide and be followed by an afebrile puerperium. That, further, even a severe and generalized sepsis can be cured by protein therapy may be shown by the following case.

CASE 6.—Primipara of thirty-two years, patient of Dr. Damron. Premature rupture of membranes. After thirty hours of labor delivery by midforceps in a farmhouse; second degree tear. There followed two weeks of chills, one to three daily, and fever which on one occasion rose to 108°! On transfer to the city, insignificant findings on examination; slight tenderness of right parametrium. Lochia normal. Urine negative. Leucocytosis of 12,400 with 80 per cent polymorphonuclears. Diagnosis: Pyemia arising from septic thrombosis of pelvic veins.

Plan of treatment: fresh air; forced feeding; milk injections.

Patient received five injections in first nine days. Lytic decrease of fever, and

complete disappearance of chills. Leucocytic reaction varied between 16,200 and 20,500. Very marked subjective improvement. After two weeks, a large abscess developed in culdesac which was incised and drained. Six days later a second abscess in the right labium majus and beneath the mons veneris required incision; from the immense abscess cavity a sequester of the symphysis was removed. After another two weeks, copious expectoration of sputum containing streptococci, staphylococci and pneumococci, disclosed the breaking through of a pulmonary abscess. Finally, an abscess occurred in the right thigh which, on incision, was found to have laid the sartorius muscle bare. During the protracted course of the illness patient received seven additional milk injections. Ultimate outcome: complete recovery.*

It seems to me that the gratifying result obtained in this case brings out the two essential points in protein therapy. The cell stimulation produced by the milk injections before complete exhaustion had set in, checked the progress of an infection of which we know from an unfortunately extensive experience that it almost always leads to death, and it also localized the various embolic metastases and favored the speedy formation of circumscribed abscesses thereby preventing them from becoming secondary foci of a generalized sepsis.

Of other febrile complications in the puerperium I wish to mention two cases of puerperal pyelitis which were cured after two and three injections, respectively.

The curative effect of plasma activation has induced a number of writers to inject proteins prophylactically in all cases where a febrile puerperium might be expected from the nature of the confinement.

Protein injections, finally, have been suggested as a galactagogue. The opinions regarding this particular indication are still divided; my own experience limited thus far to one case, was inconclusive.

I have already pointed out that the milk injections should occasionally be combined with other methods. Indeed, there is no reason whatever to discard tried and valuable modes of treatment.

It has become obvious that milk injections—or, generally speaking, protein therapy—have a very extensive applicability in gynecology and obstetrics. A moment's reflection will make the widespread usefulness of this novel agent appear less surprising. We call the new method a therapy, and yet, strictly speaking, it is not a mode of treatment in itself. It is merely a means to set in motion reactions with which we have long been familiar, the same reactions in fact which the organism uses to defend itself against disease.

In spite of its ample scope, however, its limitations must not be overlooked. There are several absolute contraindications, such as cardiac decompensation, diabetes, and alcoholism. Whether pregnancy belongs to this group is still an open question. Petersen enjoins great caution where there is a history of hypersensitiveness on the part of the patient (serum sickness, asthma, urticaria, angioneurotic edema)

*The case will later be published in detail.

or of epilepsy or other grave nervous instability. Above all, the state of the disease and the condition of the patient must be considered. Only if the cells are not hopelessly damaged or if the patient has not reached the state of complete fatigue, may milk injections be tried lest they superimpose an extra demand to which the exhausted organism must succumb.

But even where protein therapy is clearly indicated, success is not achieved in all cases. Disappointing though this is, a certain percentage of failures must be expected. *Protein therapy is as little a cure-all as any other mode of treatment.* To employ it injudiciously and by rule of thumb in one and every case threatens to bring a valuable method into discredit. Moreover, we are but at the threshold of this new field and its vast outlook. The skeptic may conceivably refuse to enter because there is still too much in a state of flux, too much that has not yet been definitely proved. But those who have passed through the gate and have been rewarded with unexpected success, are not likely to become discouraged by occasional failures but will continue to explore the new territory. A number of important problems are yet to be worked out by the clinician. The determination of the dosage, for instance, is still entirely empirical. It may be that the object of cell stimulation in the various ailments will be better accomplished by one or the other protein substance,* or that changes from one to another substance will be found desirable in different stages of the same disease. Finally, the combination of specific with nonspecific therapy may offer possible advantages in certain forms of disease.

Whatever its present shortcomings, let us bear in mind that nonspecific therapy is, probably, the most rational of all forms of medical therapeutics in that it exerts its influence directly upon the very basis of disease, namely, the affected cell. "Needless to say," to quote Petersen, "nonspecific therapy does require judgment, careful attention and bedside study on the part of the physician, perhaps in greater measure than any other therapeutic procedure. It should never be a routine; to be useful it must be an individualized therapy, with dosage and preparation and time of application varied according to the disease, its intensity, its duration, and the resistance of the patient. So used, nonspecific therapy should prove to be one of our most useful measures both in acute infectious diseases and chronic inflammations."

BIBLIOGRAPHY

- (1) *Verworn, M.*: Irritability, Yale Univ. Press, 1913, lxxvi, 76. (2) *Davidman, A., and Dolley, D. H.*: Cloudy Swelling a Process of Stimulation, Jour. Med. Research, 1921, xlii, 515. (3) *Dolley, D. H.*: The Recovery from Depression in the Purkinje Cell, etc., Jour. of Comparat. Neurology, 1917, xxviii, 465. (4) *Petersen, W. F.*: Protein Therapy and Nonspecific Resistance, New York, Macmillan, 1922. (5)

*This refers, for instance, to the interesting observations of A. Mayer concerning the effect of serum of normal gravidæ upon toxic dermatoses in pregnancy.

Quoted from Petersen (4). (6) *Lindig, P.*: in *Biologie und Pathologie des Weibes*, edited by Halban and Seitz, Berlin and Wien, Urban and Schwarzenberg, 1923, ii, 255. (7) *Schmidt, R.*: Ueber Proteinkoerpertherapie und ueber parenterale Zufuhr von Mileh, *Med. Klinik*, 1916, xii, 171. (8) *Lindig, P.*: Das Casein als Heilmittel, *Muenchen. Med. Wochenschr.*, 1919, xvi, 1921. (9) *Kleeblatt*: Zur Frage der Dosierung und des Intervalls, *Ther. d. Geg.* 1921, lxii, 209. (10) *Barkan, O., and Nelson, R. F.*: The Active Agent in Milk Injections, *Jour. Am. Med. Assn.*, 1924, lxxxii, 190. (11) *van Randenborgh, A.*: Anaphylaktische Erscheinungen bei Proteinkoerpertherapie, *Zentral. f. Gynäk.*, 1920, xlv, 1128. (12) *Gellhorn, G.*: The Treatment of Pelvic Infections by Injections of Milk, *Jour. Missouri State Med. Assn.*, 1922, xix, 341. — Non-Operative Treatment in Gynecology, New York and London, D. Appleton Co., 1923. (13) Quoted from Petersen: (4). (14) *Stegemann, H.*: Inaug. Diss., Kiel, 1920. (15) *Gaertner, H.*: Beitrag z. Caseinbehdg, *Berl. Klin. Wehnschr.*, 1921, lviii, 1108. (16) *Fantl, G.*: *Wiener Klin. Wehnschr.*, 1921, xxxiv, 17; R. Mueller, *Deutsch. Med. Wehnschr.*, 1918, xlv, 545; Artom, *abstr. Deutsch. Med. Wehnschr.*, 1922, xlviii, 1714. (17) *von Jaschke, Th.*: *Tr. Germ. Gynäk. Soc.*, 1921, xvi, 127. (18) *Doederlein, A.*: Zur Behdlg. des Puerperalfiebers, *Deutsch. Med. Wehnschr.*, 1922, xlviii, 22. (19) *Simon, W.*: Proteinkoerpertherapie d. Fieberhaften Abortes, *Zentral. f. Gynäk.*, 1922, xlv, 1837. (20) *von Jaschke, Th.*: Erfahrungen mit d. Proteinkoerpertherapie, etc., *Ther. Halbmonatsh.*, 1921, xxxv, 539.

METROPOLITAN BUILDING.

(For discussion see page 649.)

RECENT OBSERVATIONS OF CERTAIN PATHOLOGICAL CONDITIONS OF THE AMNION*

BY RICHARD PADDOCK, M.D., ST. LOUIS, MO.

(From the Department of Obstetrics, Washington University School of Medicine.)

IN the routine examination and study of the placenta, one observes from time to time, certain small areas on the surface of the amnion, which appear in the gross as changes in the membrane. From the literature on the placenta it is seen that lesions have been noted in one form or another by some of the older writers on obstetrics and pathology, as well as by some of the more recent observers.

J. Y. Simpson, in his classic monograph on "*Pathological Observations on Diseases of the Placenta*," mentioned certain lesions of the amnion as "floculi of coagulable lymph," and associated them with inflammation. He also notes that these spots are seen in cases of "dropsy of the amnion." Rokitsanski in his "*Manual of Pathological Anatomy*," recognizes the presence of these lesions. To quote:—"The dirty white and ash-colored spots occurring in various sizes upon the amnion and accompanied by thickening of the membranes, and the opacity sometimes affecting the greater part of the amnion, evidence previous inflammation." Again he notes—"Occasionally the membranes, in consequence of a cretification of the deposit, are encrusted or contain chalky grit."

The observations of the occurrences of these lesions by these older writers are of value only as case examples, for at the time, no accurate histologic studies were made, owing to the current limitations of microscopy and microscopical technic. After the establishment of more careful methods, by which the microscopical structure of the tissues could be studied, more investigators took up the study of the amnion. In the search for the origin of the amniotic fluid, various workers found considerable variation in the structure of the amniotic

*Read at a meeting of the St. Louis Gynecological Society, May 9, 1924.

epithelium. It has been demonstrated by von Franque, Polano, Bondi, Mandl, Forssell, and others, that the amnion shows differences in structure over various areas in the same cases. Although this fact has been well established for many years, the various textbooks for medical students do not mention it. This is also true of the reference books gone over in the preparation of this paper.

Von Franque, in 1897, described certain warty and nodular elevations occurring on the surface of the amnion. These areas showed proliferative changes in the epithelium, with stratification and cornification, as well as an overgrowth of connective tissue through defects in the epithelial layer and extending over the surface of the amnion. In these cellular masses he found lanugo hairs, epithelium, and vernix caseosa. The description given does not correspond with the findings described in this paper.

Holzappel, in 1904, described one type of lesion showing cornification of the amniotic epithelium with proliferation. However, the observation was originally made in a case of deformity of the fetus and the author suggests the possibility of these areas as being transplants of fetal ectoderm. There was no evidence of transplants in any of the cases noted in this paper.

Sitzenfrey, in 1911, in work on anomalies of the amnion, reported a few cases where lesions were seen on the amnion. The type of lesion itself was not accurately described. The lesions he had reference to seemed to be due to areas of proliferating amniotic epithelium, with surface changes and secondary changes in the subepithelial connective tissue. In these cases the lesions were studied for evidence of tuberculosis, but no characteristic pathology was made out. The evidence for tuberculous infection of the amniotic fluid was very meagre, even when animal inoculation was resorted to as a diagnostic measure. In cases reported by Sitzenfrey it was noted that there was a definite oligohydramnios. The lesion was then investigated with the possibility in mind, that the lack of amniotic fluid might be the etiologic factor. Sitzenfrey reported that the detritic layer, seen over the surface of the amniotic epithelium, contained lanugo hairs and that the greater part of the material was composed of vernix caseosa. He then explained the lesion on the following basis:—On account of the insufficiency of amniotic fluid, the fetus was brought into direct apposition with the amnion. Because of this apposition, the lanugo hairs of the fetus perforated the epithelium of the amnion and set up an inflammatory reaction in the tissues, resulting in proliferation, with the adherence of some vernix caseosa and enmeshed lanugo hairs.

The reasons ascribed for the appearance of these lesions at the placental area of the amnion are: This portion of the tissue is relatively fixed and does not allow the freedom of movement between the fetus and adjacent membrane. This explanation seems rather vague and it is difficult to conceive of such unusual lesions produced by this method, where contact is made between two tissues so normally in relation. Then too, other observers have noted similar lesions in hydramnios, which fact shows a marked diversity of the conditions in which they may occur.

Other authors—namely Thoms and Creadick—have demonstrated cellular change in the amniotic epithelium which is dependent upon the length of time before delivery that the membranes rupture. Creadick has demonstrated bacterial invasion of the amnion in cases where the membranes were ruptured a relatively long time before delivery. None of the changes described by the latter authors would account for the lesions in question.

Since the first of these lesions were seen in our routine placental study, a careful search was made for more of the lesions in the case of each placenta studied. After a few lesions were noted it was seen that the gross picture presented two types of lesions, which will

be referred to subsequently in this paper as Type "A" and Type "B". The differences between both types are perfectly clear in the gross, so that from the gross appearance of any of these lesions the microscopic appearance can be foretold.



Fig. 1.—Section through entire lesion showing epithelial proliferation, and the dense granular area in the connective tissue stroma. Ob. Lab. No. 3911.



Fig. 2.—Higher power of left central portion of Fig. 1, the upper margin of the granular area. Above is the connective tissue in which a few pale nuclei are seen. Ob. Lab. No. 3911.

Type "A" consists of a well defined, round or ovoid area situated in the placental area of the amnion, or in the amnion near the placenta. In size the lesions thus far examined vary from 2 x 2 mm. to 5 x 7 mm. in diameter. The structure seems to be situated in the

amniotic membrane. In color it is a dirty white or cream color. The external surface is rather rugose. The surface is elevated slightly. The general appearance is that of a large bacterial or fungus colony growing on culture media. It is opaque, and when the amnion is

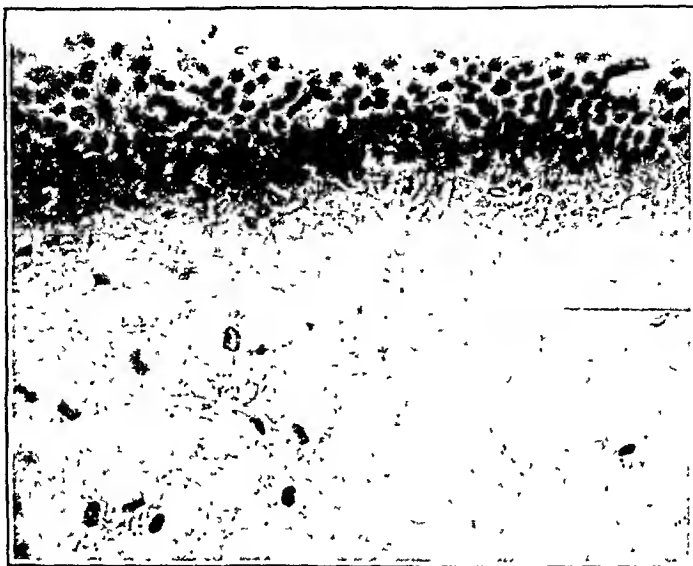


Fig. 3.—Higher power of upper portion of Fig. 1, showing proliferation of epithelium. Connective tissue on right shows fewer nuclei and a more homogenous appearance. Ob. Lab. No. 3911.

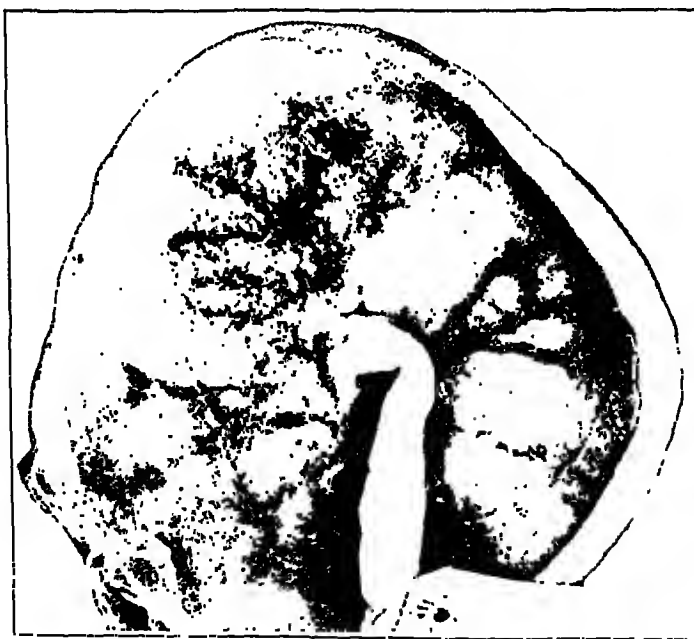


Fig. 4.—Photograph of placenta showing Type B lesions and distribution in amnion. Ob. Lab. No. 3938.

stripped off the chorion, it does not lose its identity as an amniotic growth. There has been only one of these growths seen in any single case.

On microscopic examination the principal change is seen within

the connective tissue (Fig. 1). Enclosed within the connective tissue is a diffuse, dense granular area which takes the hematoxylin stain deeply. On higher magnification it is seen to be made up of tiny granules and small fibrils (Fig. 2). This substance is the result of calcium deposit. In the preparation of these sections it was found necessary to decalcify the tissues before satisfactory sections could be obtained. Between the small granules the included substance takes a rather pink, homogenous stain. Nuclei of connective tissue cells in this area are very pale and appear degenerating. A few round cells are seen at the margins of the granular material. Around the calcified material the stroma has a more dense, hyaline appearance; fibrils are ill defined and nuclei are fewer. At either end of the region the normal stroma seems to separate and encapsulate the material. The epithelium over the area is not constant. There seems to be a tendency toward proliferation with squamous cell formation (Fig. 3). In one case the epithelium appeared normal, in another it was entirely degenerating; while in another the cells were all cylindrical with nuclei toward the free surface. In the cases where the epithelium appears most abnormal the connective tissue takes a more homogenous appearance, with fewer nuclei and a deeper pink stain. No bacteria could be found in any of the lesions.

Type "B." A flocculent, cretaceous area appearing on the placental area of the amnion, either singly or in numbers, usually in large numbers. These areas vary from the smallest macroscopic size to those with a diameter of eight millimeters. The outline is externally irregular and some of the plaques are confluent. They have the general appearance of having been sprayed on the amniotic surface as one would spray lime water from the end of a brush (Fig. 4)

These areas appear slightly elevated and some of the larger have an umbilicated appearance. The distribution of these lesions is quite irregular, some being scattered over a definite area of the placental surface while in other cases they have a linear arrangement, extending outward from the insertion of the cord. In the fresh and in the hardened specimens they do not rub off but maintain their positions even until the amnion is torn by rubbing. The opacity of these areas is very marked.

On microscopic study the primary changes are seen in the epithelium. At the margins of the areas in question the epithelium undergoes a rather sudden transition to the squamous type (Fig. 5). The cells of the base of these areas take a more intensive stain, with well-defined nuclei, usually toward the base of the cell. There is no basement membrane. Farther out in the layers the cells take a more squamous appearance and a lighter stain, with nuclear degeneration. At the outer surface where the cells are necrotic the epithelial surface is covered with deep pink-staining strands of degenerated cells and

detritis (Fig. 6). The general microscopic appearance is that of a hyperkeratosis. These degenerated outer layers show only very faint outlines of cell structure, with shadow-like areas at site of former nuclei. There is a very fine calcification in this cell debris, as evidenced by the bluish tinge seen under oil immersion lens. In no case could lanugo hairs be seen, or evidence of vernix caseosa be demon-



Fig. 5.—High power magnification at the margin of Type B lesion showing the sudden transition from the usual amniotic epithelium to the squamous type of epithelium with keratosis. Ob. Lab. No. 4103.



Fig. 6.—High power magnification of one of the lesions in Fig. 4, showing typical appearance of the lesions with squamous type of epithelium. Note nuclear degeneration in outlying layers. Only faint outlines of cells seen in outer layers. Stratification of cellular debris to the right. Subepithelial connective tissue is almost homogenous in this area. Nuclei are only faintly seen.

strated. In some of the outer cells were noted fine black granules, probably the same as noted by some of the other observers.

The subepithelial connective tissue also undergoes changes in the lesions. Just beneath the epithelium the connective tissue is more compact, takes a deeper pink stain and nuclei are fewer. The connec-

tive tissue as a whole is more fibrillar and throughout run longitudinal, wavy, fine calcium strands. This is not uniform in all cases but appears frequently. Where the connective change is most marked there are more round cells seen here and there. No bacteria could be found in any of these lesions. In the outer epithelial layers a few enmeshed red blood cells could be seen.

OCCURRENCE

In 248 placentae studied routinely the lesion "A", the first described, occurred eight times. The lesion "B", just described, occurred ten times. It is seen from the figures that these lesions are not rare. To give a brief clinical review of the cases in which these lesions occurred:

In cases of the first lesion, Type "A".

Seven mothers were multiparous.

Only one was luetic.

There were four with gestation of 40 weeks, one of 41 weeks, one of 39 weeks, and two of 36 weeks.

One had toxemia with albuminuria, hypertension and edema.

All of the children were living at birth with the exception of one stillbirth from the toxemic mother.

In the cases of the second lesion, Type "B".

Six of the mothers were multiparae and four were primiparae.

All children were born living.

Two mothers were being treated for lues; all others were nonluetic.

The periods of gestation were all forty weeks or more with the exception of one of 36½ weeks.

There were no cases of hydramnios, oligohydramnios, or twins in the series.

The placentae in these cases showed no striking lesions. There were the frequent small hematmata in some, others showed some red or white infarction. Several showed diffuse white mottling on maternal surface due to calcification.

SIGNIFICANCE AND CAUSES

Since in both types of these lesions the children showed no signs or symptoms of antenatal pathology referable to the lesion, it can be presumed that the lesion is of little apparent significance to the life of the child. The majority of the mothers were nonsyphilitic so that syphilis may be ruled out as a productive factor. The lesions were seen in primiparae as well as in multiparae. No bacteria or lanugo hairs were found. Since the fetal membranes are part of a caduceous organ in which senescent changes go on at the time of maturity, it seems that these lesions might be explained, at least in part, on that basis.

The first type of lesion, as has been shown, occurs within the sub-epithelial connective tissue at or near the placental site. Here the tissue is relatively fixed to the placental surface so that mobility in this area is limited. Any change in size or shape of the amniotic cavity would put a relative strain on the tissue at this area. Any defect in the tissue, as a result of interstitial tearing, would be compensated by an accumulation of serofibrinous exudate from the adjacent tissues; just as in the placenta itself near the time of maturity any injury is followed by the laying down of fibrin at the site. Subsequently calcification takes place in the serofibrinous deposit. There is moderate subsequent reaction in the adjacent connective tissue, with subsequent change in the epithelium overlying the area.

Type "B," the second type of lesion, probably represents another senile change in the tissue, involving primarily the epithelium. The amniotic epithelium, because of its structure and function, might be termed the endothelium of the amniotic cavity. Any injury or senile change in the character of the membrane would lead to a proliferation of cells, just as in the senile changes in the intima of the blood vessels, with proliferation and subsequent sclerosis, with degenerative and sclerotic changes in the underlying connective tissue. This particular type of epithelial change in the amnion is probably a characteristic metaplasia of this embryonic structure. In regard to this type of epithelial change in embryonic tissue, it may be mentioned in passing, that a similar change was noted in a case of dermoid cyst of the ovary. In a case recently studied by Dr. Otto Schwarz an epithelial change similar to the changes seen in the epithelium of the amnion was noted in a portion of the epithelium forming the cyst wall.

These explanations are hypothetical, but may very well be true on the basis of the senile nature of the amnion as the termination of gestation is approached.

CONCLUSIONS

1. Two types of lesions are relatively frequent in the amnion.
2. One consists primarily of calcium deposit in the subepithelial connective tissue, with subsequent changes in the epithelium.
3. The other is a primary change in the epithelium with subsequent changes in the connective tissue, accompanied by calcium deposit in the tissues affected.
4. These lesions are not dependent on conditions of hydramnios, oligohydramnios, disease of the fetus, or constitutional disease of the mother.
5. They are most probably brought about by senile changes primarily affecting the portion of tissue which shows primary changes.

BIBLIOGRAPHY

Simpson, J. Y.: Pathological Observations on Diseases of the Placenta, Edinburgh Med. and Surg. Jour., 1838, p. 265. *Rokitanski*: A Manual of Pathological Anatomy, Trans. Edward Sieveking, ii, 346. *Von Franque*: Zur Kenntniss der Amnion Anomalie. Monatschrift für Geburt. und Gynäk., 1897, vi, p. 37. *Mandl, L.*: Weitere Beiträge zur Kenntniss der Secretorischen Tätigkeit des Amnionepithels, Arch. für Geburt. und Gynäk., 1906, lviii, p. 249. *Forssell, O.*: Zur Kenntniss des Amnionepithels in Normalen und Pathologischen Zustände, Arch. für Geburt. und Gynäk., 1912, xvi, p. 436. *Holzappel*: Zur Pathologie der Eihäute. Beiträge zur Geburt. und Gynäk., 1911-1912, xvii, 22. *Sitzenfrey*: Ueber Amnion Anomalien. Beit. zur Geburt. und Gynäk., 1911-1912, xvii, 1-10. *Thoms, H. K.*: Columnar Amniotic Epithelium, New York Med. Jour., Dec. 2, 1916, p. 1090. *Creadick, A. M.*: The Frequency and Significance of Omphalitis, Surg. Gynaec. and Obstet., xxx, p. 278, March, 1920. *Strachan, G. I.*: Development and Structure of Human Placenta, Jour. Obst., Brit. Emp., xxx, 635. *Williams, J. W.*: Obstetrics, 1923, 673.

CHORIOANGIOFIBROMA (CHORIOANGIOMA)

BY R. S. SIDDALL, DETROIT, MICHIGAN

(From the Obstetrical Department, Henry Ford Hospital.)

(Continued from October issue.)

ORIGIN

INASMUCH as neither the early forms nor the successive steps of the development of chorioangiofibromata have ever been incontestably identified, there exists much uncertainty in regard to both the time and place of origin. John Clarke, in 1798, said, "I am disposed, therefore, to consider this fleshy substance as a solitary instance of a formative property in the vessels of the placenta, etc.," and to this opinion very little has since been added. That the growth arises from the chorionic tissue of the placenta is evidenced by the histological structure. Danyau and Goodhart, though describing undoubted chorioangiofibromata, were apparently at a loss to explain their origin, speaking of them, with reservations, as organized blood clots. Certainly, with our later knowledge, the histological picture alone makes such an explanation untenable. Van der Feltz spoke of his well-defined chorioangiofibromata as "false knots" of the umbilical cord lying in the placental tissue, since he believed that he could distinguish a passage of cord tissue over into one of the tumors. However, the other had an investment of Langhans' cells and was connected to the cord by vessels only. Furthermore, he said, "Dieser Tumor bestand also offenbar aus angiomatös verändertem Chorionhindegewebe,—." Albert advanced the idea, in keeping with his time, that the vessels are derived from the allantois, and Dienst agreed to the same origin for the vessels and said that the tumor stroma came from the chorion. However, Schiebele, in 1905, emphasized the fact that the villus vessels develop *in situ*, and that in man the allantois is rudimentary, the connection between the placenta and embryo being

by the umbilical vessels of the abdominal pedicle or "Bauchstiel"; which opinion is undoubtedly borne out by the facts. The question as to origin of these tumors from a single villus or from an adherent cluster of villi will be considered under the discussion of etiology. However, it may be stated here that the preponderance of evidence is in favor of development from a single villus.

The time of origin of these tumors is even less settled than is the place of their beginning. Upon purely theoretical grounds, Pitha, Albert, Beneke, Dienst and others have assigned the beginning development to the early weeks of pregnancy at the time when active vascularization and formation of the placenta is taking place, as at that period anomalies would naturally be most frequent and have the greatest effect upon later growth. Perhaps the findings of Storch might be considered in support of this idea of an early beginning, for he pointed out the not infrequent occurrence of hypertrophy of the villi in the placentas of early abortions, and considered this condition to be an early stage of chorioangiofibroma.

On the other hand, Kraus and Schickele believed that these tumors may begin at any time during pregnancy, usually after the villi are formed. Any opinion as to their origins can be only conjecture unless intermediate stages should be found to show the growth of these altered villi into the fully developed tumors, which with the single exception of the very doubtful case of Cammandeur-Lacassagne, have been described as occurring during the latter half of pregnancy. The epithelial covering offers no clue as to the period of onset, since in different tumors the syncytial cells and the Langhans layer have been present alone or in association with each other.

ETIOLOGY

When the uncertainty with regard to origin is borne in mind, it is not surprising that even more question exists concerning the predisposing factors and the etiology of these tumors. In fact, consideration and conjecture upon the basis of the available facts, although leading to the formation of various hypotheses, have failed to develop any which are entirely compatible with both recognized scientific principles and with the circumstances present in more than a small portion of the cases. In a preceding paragraph, the explanation of these tumors as possibly arising from organization of blood clots (Danyau and Goodhart) was quickly disposed of and need not be further considered. Likewise, the contention of Grafenberg and Hildebrandt that the condition is the result of degeneration and necrosis need be considered no further than to point out the unquestionable proliferative characteristics which have been noted by nearly all observers. Nebesky discusses this point in detail. As mentioned before, Storch in 1878 believed that the early stage of chorioangiofibroma was represented by hypertrophy of the villi

which he claimed was frequently found in the placentas of early abortions, and which he believed was the result of chronic endometritis. It is significant that endometritis was reported only once in this series (by Loennberg), and that careful examinations by other observers showed no evidence of inflammation of the fetal tissues or of the decidua attached to the placenta. Some years after Storch, Albert pointed out that since endometritis is usually widespread, one would not expect the involvement of only a very limited area of the placenta, or of only one placenta in the case of twins. On the other hand, little importance can be attached to the latter author's explanation that allantoic vessels growing out to the chorion may there find improper implantation with resulting excessive growth, since we now know that vascularization of the placenta is not from the allantois, nor by the outgrowth of umbilical vessels but by their development *in situ* (Schiekele). Just as the endometritis theory is not supported by findings in the majority of cases, so the explanation of these tumors as inflammatory products (Loennberg, Von Mars and others) is not in accord with the facts, for rarely have evidences of inflammatory reaction been seen, and in certain very early cases they were reported as being absent (Alin and others). Even more improbable is the clinical deduction of Plauehu and Savy that we have to deal with an uncommon result of syphilis, for in only four cases has syphilis been mentioned, and several times it has been satisfactorily ruled out by both serological reactions and clinical evidence.

A number of observers, notably Labhardt and Kraus, have seen clumps of more or less adherent villi which resemble these tumors, especially since the vessels are frequently dilated, and Schiekele believed that some tumors may develop in this way. Kraus, however, found that upon close examination the individual villi in such a picture could be distinguished by the more or less complete persistence of the epithelial covering. Moreover, as pointed out by Müller, these clumps are not sharply defined from the normal placental tissue, nor would it be possible for them to be attached by a thin pedicle alone as are so many true chorioangiofibromata. These clumps are commonly found in a zone surrounding large tumors and are conceivably the result of pressure from weight and expansive growth. They have also been found dispersed through a large part of the placenta in a condition discussed at length by Müller under the title of "angiectasis of chorionic villi." He found areas in which the villi were plastered together and angiectatic, due to stasis resulting from thickening of the vessel walls, with finally necrosis of the villi. In addition to this picture, one placenta showed an extensive inflammatory reaction. He quotes the case of von Franke, who called the condition "placentitis." Solowij has described a similar picture (hypertrophy compensatory to widespread infarction?); as have also Seitz and Schindler, except that the change is more limited in their cases. Certainly, there seem to be valid reasons to believe that none of

these changes could lead to the well-defined picture of chorioangiofibroma.

Many authors arguing upon the basis of a limited number of clinical, histological and experimental facts, have maintained the cause to be a circulatory disturbance, either of the maternal or of the fetal system. Dienst was the principal champion of the former after considering various hypotheses, and he concluded that during formation of the placenta hypertension in the maternal vessels promoted a protective hyperplasia on the part of certain villi which went on to tumor growth. An evident objection to this idea, besides the fact that such a reaction would be expected to be more widespread (Kermauner), is that the clinical histories would indicate only a small proportion of cases in which general or local uterine hypertension or other circulatory disturbance could be expected. More worthy, probably, of serious consideration from the etiological standpoint, is circulatory stasis in the fetal vessels from some cause. Some experimental basis for this hypothesis is found in the frequently mentioned work of Jores who produced angiomata, or at least angioma-like conditions, in the cat's liver by causing inflammatory venous obstruction and stasis. Likewise, Müller, as discussed above, found angiectasis of villous vessels following upon inflammatory thrombosis. Pitha advanced the idea that passive hyperemia might be caused by twisting or other distortion of the early villi. The idea of Schindler, Maxwell, and others that some defect of the cord vessels might lead to tumor formation is doubtful, for in that case stasis and its hypothetical effect (tumor formation) would be expected to be widespread in the placenta. These authors also believe, as do others, that the stasis might be from conditions existing in the placenta itself. Proliferation of endothelial cells, though denied by Oberndorfer, has been noted frequently and was thought by Beneke to be a possible cause of stasis in the placental vessels, so marked in certain areas as to lead to tumor formation. Van der Feltz and others thought that, among other causes, pressure from the frequently associated hydramnios might cause sufficient circulatory disturbance. However, as observed by Dienst, Kraus, and others, hydramnios might rather be considered as an effect than a cause. Nebesky believed that it would be more correct to say that stasis favored an angiomatous proliferation in the presence of an underlying predisposition. Kermauner, though admitting the possibility of hyperemia as a factor, believed the cause to be unexplained. It is interesting to note that Alin as early as 1890 seems to have considered these main hypotheses, for he says that he found no evidence of hemorrhage, degeneration, inflammation, or disturbance of circulation.

NATURE OF THESE TUMORS

Much conjecture and discussion have arisen in regard to the nature of the chorioangiofibroma. The early opinion of Virchow and that of

Valeri, which associated the condition with early forms of hydatidiform mole or chorioepithelioma now has no reasonable foundation. Other unlikely hypotheses of origin which have been discussed under other headings need not be mentioned further here, but rather will we be concerned with the question as to whether this epithelial covered mass of hypertrophied or proliferated chorionic connective tissue and blood vessels is a true tumor or not. Several writers, e. g., Storeh, Merttens, and Guéniot speak of the condition as hyperplasia. Van der Feltz further denies the presence of the three characteristics of true tumors, i. e., (1) spontaneous genesis, (2) atypical tissue structure, (3) unbounded growth without typical termination. On the other hand, Dienst presents argument for spontaneous origin, for atypical structure if not atypical tissue elements, and for growth which is limited only by necrosis (as may occur in any tumor) and expulsion of the placenta. However, he believes that the point cannot be settled either way and supports the designation of tumor in the "wider sense." Gräfenberg argued upon the basis of the experimental production of angiomatous conditions in the liver by ligation of the hepatic vein that these, and likewise angiomata of the placenta, are not true tumors. It does seem that this experimental condition of the liver vessels represents only a dilatation and not a growth. However, the placental angiomata, contrary to Gräfenberg's contention that heaped up endothelial cells are the result of contraction of the vessel walls, have frequently shown a marked proliferation of endothelium as evidenced by reduplication of layers, numerous mitotic figures, and solid outgrowths becoming canalized to form new capillaries (Theuveny, Bertolini, and others). Certainly the process would seem from this to be one of growth rather than of degeneration as favored by him. Nebesky further calls attention to the frequent evidences of active new growth in the stroma as shown by its cellularity, which is sometimes of such a degree as to suggest sarcoma. He considers degenerative processes as secondary to primary tumor growth. Hauser, after a careful consideration of the evidence, was still undecided as to whether or not we had to deal with a true tumor.

CLINICAL ASPECTS

Maternal.—As has been pointed out by reviewers of this subject, there is little added danger to the mother because of the presence of chorio-angiofibroma. A review of the abnormalities of pregnancy, a summary of which has been given in an earlier section, shows that, with one exception, there are no disease conditions which are more frequent in this series than should be expected among a like number of average obstetrical patients. The exception is hydramnios which, however, with our present knowledge cannot be held as a condition particularly dangerous to the mother although it seems to predispose to the appearance of toxemia symptoms. There was no such association in this series. The

incidence of operative deliveries was not excessive,—10 per cent of the whole series or about 12.8 per cent of the cases where data concerning labor were given. From the evidence in this series there would seem to be a slightly added risk to the mother during the third stage of labor, for postpartum hemorrhage and operative removal of the placenta or tumor were each noted six times, and in four other cases manual removal of the placenta was necessitated by excessive bleeding. Albert noted this high incidence and believed that the increased size of the mass in the uterus due to the tumor prevented satisfactory uterine contractions. In this connection, it is to be noted that among these sixteen cases nearly all the tumors were very large including Dupin's and Chabaud's (780 grams). On the other hand a similar result might be ascribed to the effect upon the uterine muscle of the excessive distention by hydramnios, which was present here seven times.

Fetal.—Although some consideration must be given to the suggestion that the tumors which are associated with an important clinical finding or result would be more likely to be described, still such an explanation cannot be held as quite sufficient for the high incidence of prematurity and fetal mortality among the reported cases. Albert in 1898 in a review of 36 cases noted that only one-third of the children were normal. The others were stillborn, below normal weight, or premature and died within a few days. In six cases there was no record. Dienst found a gross mortality of 33 per cent among 39 cases of his collection in which the condition of the child was given. The usual cause of death he ascribed to asphyxia, though a review of the reports does not show how he came to this conclusion. Nebesky and Sadewasser state the mortality as being about 35 to 40 per cent. Such figures correspond with those obtained from the larger series here given, for 41 children were still-born or died in early infancy, a mortality of 31.3 per cent for the whole series, or 37.6 per cent for the 109 children about which data were given. Nebesky believed that the situation of the tumor in relation to the cord had no bearing upon fetal death, and this opinion is supported by the fact that there is no increase in the mortality (32.1 per cent) among the 28 cases of this series in which the tumor was under or adjacent to the insertion of the cord. He further believed that the prognosis for the child was not affected so much by the size of the tumor as by the amount of remaining healthy placental tissue, and whether or not this was sufficiently free of pressure for adequate function. However, in the placentas of 76 of the above mentioned 109 children there was a large amount of tumor tissue (size of a hen's egg or greater), and the gross mortality was slightly but definitely increased (39.5 per cent) over that for the remaining 33 (33.3 per cent). Moreover, an opinion regarding prognosis upon the basis of the proportion of the remaining and functioning placental tissue does not permit of more than conjecture because of the insufficient detail of the data which

are available. The results of the six cases in which the weights of both the tumor and placenta are stated give only suggestive evidence in support of this view. (See Table II.) In this connection it is interesting to note that Auvard (1887) attributed both the size of the tumor and the prognosis for the child to the varying degree of vascular stasis in the placenta.

TABLE II

CLINICAL RESULTS IN SIX CASE REPORTS IN WHICH WEIGHTS OF BOTH THE TUMORS AND THE PLACENTAS WERE GIVEN

AUTHOR	TUMOR GRAMS	PLACENTA GRAMS	APPROX. RATIO	DEVELOPMENT	HYDRAM- NIOS	RESULT
Roscher	150	1700	1/11	Term (?)	no	Living
Theuveny	80	650	1/8	Term	no	Living
Ravano	75	450	1/6	Premature	yes	Died
Trillat	400	1130	1/3	Term	no	Living
Calderini	335	790	2/5	Premature	yes	Stillborn
Pulverenti	740	712	1/1	Term	yes	Asphyxia pallida.

It was thought that a study of this series might give more definite information in regard to fetal mortality than had been obtained from previous and smaller collections. As stated before, there were 109 children concerning whom there was sufficient information for statistical use, and in Table III the data in regard to the most important factors are tabulated. The relative infrequency of other possible factors (twins 5 times, developmental anomalies 4 times, and syphilis 3 times) and their general distribution throughout the series makes consideration of them unnecessary. However, it should be borne in mind that a larger proportion of autopsies and our later methods of diagnosis might possibly have made a substantial difference in the frequency of the last two conditions.

On examination of the data in Table III we see that among the 109 children there were an unusually large number which were premature, 35, or 32.1 per cent, and as should be expected a large proportion of these premature children died, 24, or 68.6 per cent. Here, then, in the unusual incidence of prematurity with its expected high mortality we have some explanation for the large percentage of deaths in the whole group, for of the 41, or 37.6 per cent. who perished, 24, or 58.5 per cent, were premature. Moreover, it should be mentioned that the incidence of prematurity in this tabulation is no doubt really too low, since children were considered as premature only when designated as such by the authors, or when the weight (below 2500 grams) and length (less than 45 centimeters) definitely indicated prematurity. Consequently, the rather high mortality (23 per cent) among those listed as term children may well be due in part to the inclusion in this group of some dead premature children along with those about which the information

TABLE III

INCLUDES ALL CHILDREN ABOUT WHICH THERE WERE SUFFICIENT DATA FOR STATISTICAL PURPOSES AND SHOWS THE FETAL DEATHS TO BE MAINLY AMONG THE PREMATURE CHILDREN, PREMATURITY IN TURN BEING ASSOCIATED WITH A HIGH INCIDENCE OF HYDRAMNIOS

ALL CHILDREN WITH DATA			TERM CHILDREN		PREMATURE CHILDREN	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
Whole Group	109	100	74	67.9	35	32.1
With Hydramnios	40	36.6	15	20.3	25	71.4
Without Hydramnios	69	63.3	59	79.7	10	28.6
Operative	14	12.8	8	10.8	6	17.1
Spontaneous	95	87.2	66	89.2	29	82.9
I. Survived	68	62.4	57	77	11	31.4
a. With Hydram.	16	23.5	11	19.3	5	45.5
b. Without Hydram.	52	76.5	46	80.7	6	54.5
c. Operat. del.	3	4.4	2	3.5	1	9.1
d. Spont.	65	95.6	55	96.5	10	90.9
II. Died	41	37.6	17	23	24	68.6
a. With Hydram.	24	58.5	4	23.5	20	83.3
b. Without Hydram.	17	41.5	13	76.5	4	16.6
c. Operat. del.	11	26.8	6	35.3	5	20.8
d. Spont.	30	73.2	11	64.7	19	79.2

was insufficient, but which were classed as being at term because not proved otherwise.

It is further seen in Table III that hydramnios had an unusual incidence, for of the 109 children 40, or 36.6 per cent, were associated with an excessive amount of amniotic fluid. Of these 40 children 24 perished. But, it is then noted that the majority (25, or 62.5 per cent) of the children associated with hydramnios were premature, which number represents 71.4 per cent of the premature group, whereas only 15, or 20.3 per cent, of the term children were accompanied by an excessive quantity of amniotic fluid. This disproportion in the occurrence of hydramnios was perhaps really greater than here stated as it is likely that some children associated with hydramnios and placed in the term group were premature but not recognizable as such according to the criteria employed, as outlined in the preceding paragraph. From the data available, there is no reason to believe that hydramnios in itself and directly was the cause of fetal deaths, for the children of the term group associated with an excessive quantity of amniotic fluid had a death rate (26.6 per cent) very little greater than that for the whole group (23 per cent). However, there was obviously an indirect effect in that the high incidence of hydramnios associated with these tumors resulted in an increased occurrence of premature births with the consequent high fetal mortality.

Pursuing this idea further and making use of an hypothesis, as will be explained subsequently, concerning the relation of the size of the tumors to the incidence of hydramnios, it was possible to derive two subgroups from the main series. In Table IV are given the data in regard to 76 children which were associated with large tumors, i. e.,

size of a hen's egg or larger, and Table V concerns the 27 children associated with small tumors—those smaller than an egg. Further division could not be accomplished due to insufficient detail in regard to the size of the tumors. In six the dimensions of the tumors were not given, and these are eliminated from consideration at this place. With the small tumors (Table V) it is seen that hydramnios occurred only three times (11.1 per cent), prematurity six times, or 22.2 per cent, and the mortality was 37.1 per cent. In contrast, with the large tumors (Table IV) hydramnios was present in 48.7 per cent, prematurity in 34.2 per cent, and, as was expected, the mortality was higher (39.5 per cent). See Chart I, part marked "Uncorrected."

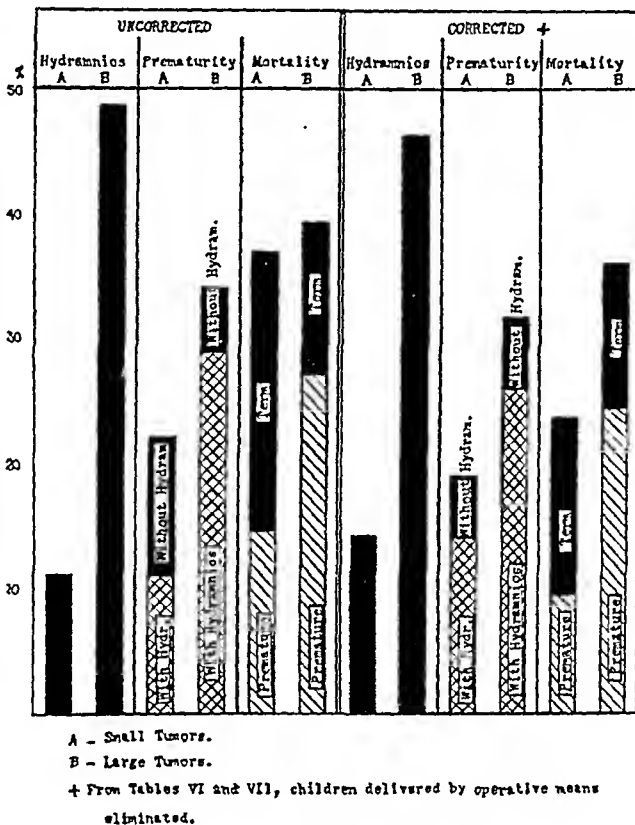


Chart I.

The difference in the results for the groups associated with small tumors and with large tumors was emphasized when we took into account and made special consideration of the next most important cause of fetal deaths, namely, operative delivery, which, though not excessively frequent, was attended by the extremely high mortality of 78.6 per cent, or 26.8 per cent of the mortality for the whole group. There was no reason to believe that interference with labor or the associated fetal deaths were consequent upon other than the usual obstetrical conditions. Certainly there were no data to indicate that either the tumors themselves or the hydramnios played any part as a cause of dystocia. Consequently as such a large proportion of children associated with small

tumors were delivered by operation, and as the impression in regard to the influence of the tumors was thus distorted by the presenece of operative deaths, it was decided to eliminate all children delivered by operation from Tables IV and V. Tables VI and VII are the result, and here the ineidence of hydramnios, prematurity, and fetal deaths

TABLE IV

DATA IN REGARD TO 76 CHILDREN, FROM TABLE III, WHICH WERE ASSOCIATED WITH LARGE TUMORS,—SIZE OF HEN'S EGG OR GREATER

CHILDREN ASSOCIATED WITH LARGE TUMORS			TERM CHILDREN		PREMATURE CHILDREN	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
Whole Group	76	100	50	65.8	26	34.2
a. With Hydram.	37	48.7	15	30	22	84.6
b. Without Hydram.	39	51.3	35	70	4	15.4
c. Operative del.	7	9.2	3	6	4	15.4
d. Spont. del.	69	90.8	47	94	22	84.6
Survived	46	60.5	40	80	6	23.1
a. With Hydram.	15	32.6	11	27.5	4	66.7
b. Without Hydram.	31	67.4	29	72.5	2	33.3
c. Operative del.	2	4.3	1	2.5	1	16.7
d. Spont. del.	44	95.7	39	97.5	5	83.3
Died	30	39.5	10	20	20	76.9
a. With Hydram.	22	73.3	4	40	18	90
b. Without Hydram.	8	26.7	6	60	2	10
c. Operative del.	5	16.7	2	20	3	15
d. Spont. del.	25	83.3	8	80	17	85

TABLE V

DATA IN REGARD TO 27 CHILDREN, FROM TABLE III, ASSOCIATED WITH SMALL TUMORS

CHILDREN ASSOCIATED WITH SMALL TUMORS			TERM CHILDREN		PREMATURE CHILDREN	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
Whole Group	27	100	21	77.8	6	22.2
With Hydram.	3	11.1	0	0	3	50
Without Hydram.	24	88.9	21	100	3	50
Operative del.	6	22.2	4	19	4	66.7
Spont. del.	21	77.8	17	81	2	33.3
Survived	17	63.9	15	71.4	2	33.3
With Hydram.	1	5.9	0	0	1	50
Without Hydram.	16	94.1	15	100	1	50
Operative del.	1	5.8	1	6.7	0	0
Spont. del.	16	94.1	14	93.3	2	100
Died	10	37.1	6	28.6	4	66.7
With Hydram.	2	20	0	0	2	50
Without Hydram.	8	80	6	100	2	50
Operative del.	5	50	3	50	2	50
Spont. del.	5	50	3	50	2	50

was respectively 46.4 per cent, 31.9 per cent, and 36.2 per cent for the large tumors in contrast to 14.3 per cent, 19.1 per cent, and 23.8 per cent for the small tumors. These conclusions are shown graphically in Chart I, part marked "Corrected."

Thus, it is evident that the high fetal mortality associated with these

TABLE VI

DATA IN REGARD TO 69 CHILDREN ASSOCIATED WITH LARGE TUMORS FROM TABLE IV
DERIVED BY ELIMINATION OF THOSE DELIVERED BY OPERATIVE MEANS

GROUP	NO. PER CENT		TERM CHILDREN		PREMATURE CHILDREN	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
Whole Group	69	100	47	68.1	22	31.9
With Hydram.	32	46.4	14	29.8	18	51.8
Without Hydram.	37	53.6	33	70.2	4	18.2
Survived	44	63.8	39	82.8	5	22.7
With Hydram.	14	31.8	11	28.2	3	60
Without Hydram.	30	68.2	28	71.8	2	40
Died	25	36.2	8	17.2	17	77.3
With Hydram.	18	72	3	37.5	15	83.2
Without Hydram.	7	28	5	62.5	2	11.8

TABLE VII

DATA IN REGARD TO 21 CHILDREN ASSOCIATED WITH SMALL TUMORS FROM TABLE V
DERIVED BY ELIMINATION OF THOSE DELIVERED BY OPERATIVE MEANS

GROUP	NO. PER CENT		TERM CHILDREN		PREMATURE CHILDREN	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
Whole Group	21	100	17	80.9	4	19.1
With Hydram.	3	14.3	0	0	3	75
Without Hydram.	18	86.7	17	100	1	25
Survived	16	76.2	14	82.4	2	50
With Hydram.	1	6.3	0	0	1	50
Without Hydram.	15	93.7	14	100	1	50
Died	5	23.8	3	17.6	2	50
With Hydram.	2	40	0	0	2	100
Without Hydram.	3	60	3	100	0	0

tumors is chiefly accounted for by the very large number of premature children, these having the usual high death rate which occurs with imperfect development. Furthermore, it is seen that hydramnios has a very high incidence, and the percentages of prematurity and fetal deaths that accompany this condition are sufficiently increased to explain their high incidence in the whole group. For the term children with hydramnios, the mortality is not appreciably greater than for the whole group of fully developed babies. We are, therefore, led to the conclusion that the high fetal mortality concomitant with these tumors is largely a consequence of premature birth, the occurrence of which is increased as a result of the frequency of hydramnios. This conclusion is also supported by the fact that, with the higher percentage of hydramnios associated with the larger tumors, there is an increased fetal death rate which falls entirely into the correspondingly enlarged group of premature children.

HYDRAMNIOS

Just as little attention in the literature has been directed toward the important association of fetal mortality with premature birth and hydramnios, so the relation of hydramnios to these tumors has been pre-

viously largely overlooked or neglected. Except for Nicolini in 1882, most authors have done little more than make mention of the high incidence of an excessive quantity of amniotic fluid in association with chorioangiofibromata. The relatively large collection of cases here given offers an opportunity to obtain some statistical facts which lead to interesting deduction and speculation regarding the origin of hydramnios in general and in connection with these tumors.

As mentioned before, hydramnios or an increased amount of amniotic fluid occurred in 36 (32.7 per cent) of the 110 pregnancies about which data is given. Comparable with these figures is the association of 40 children with excessive amniotic fluid, the difference between 36 and 40 being due to multiple pregnancy. In nine of these 36 pregnancies there occurred abnormalities which are frequently accepted as probably having some relation to hydramnios: twins, uniovular (or probable) 4 times, once with fetal anomaly; albuminuria alone twice, with cardiac abnormality of mother and child once; syphilis proved or questionable twice. However, in the remaining 27 pregnancies, or 75 per cent, none of these usually given causes of hydramnios, presumptive as they are, were found.

Further consideration shows that these cases with hydramnios can be conveniently divided into two groups according to the size of the tumor, i. e., smaller than a hen's egg or as large or larger. By this grouping we should obtain an indication of the effect of the size of the tumor in relation to hydramnios, and it is interesting to note that only three of these 36 pregnancies with hydramnios were associated with small tumors, while large tumors were present in 33 or over 90 per cent. In addition, it was found that the 27 pregnancies noted in the preceding paragraph as not accompanied by any of the usually given causes of hydramnios, were all associated with large tumors. In Tables IV, V, VI, VII and Chart I is shown the relation of the size of the tumor to the incidence of hydramnios with its consequences of premature birth and high fetal mortality.

From this evidence it seems fair to assume that chorioangiofibromata play an important part in the excessive production of amniotic fluid in the large proportion of the pregnancies with which they are associated, the percentage increasing definitely with the increase in size of the tumor masses. From the information at hand we can do nothing more than speculate upon the influence exerted by these tumors upon the mechanism of amniotic fluid formation, or rather upon the more probable hypothetical mechanisms. According to the information now available, it seems likely that normally the amniotic fluid originates mainly from the maternal vessels but is introduced into the amniotic cavity through secretory activity of the amniotic epithelium. Perhaps a small part of the fluid may be derived as a transudate from the umbilical cord or from the skin of the fetus. In cases of hydramnios

it appears that the excessive fluid may often have a different origin,—attributable to various abnormalities of mother or fetus. One of the most frequent abnormalities is obstruction in the fetal-placental circulation with production of fluid from the fetal source. It is readily conceivable that a tumor might press upon sufficient placental vessels to cause marked obstruction in the venous circulation through the placenta and fetus. Such obstructions when caused by a condition present in the umbilical cord seem to lead directly to increased secretion by the fetal kidneys, and no doubt obstruction in the placenta would give the same result. Likewise such stasis might well result in increased exudate from the umbilical cord itself. Or, stasis and hyperemia in the placental circulation distal to the tumor might lead to excessive production of fluid from the overlying amniotic surface. Another possibility for excessive production of fluid from a placental source is seen in the additional amniotic surface due to the volume of the tumor itself, this secreting surface overlying an extremely vascular tissue.

From the data obtained in this series of tumors there is nothing, other than size, which is apparent as a factor in the production of the frequently associated hydramnios. Nor do we know why some of the large tumors are accompanied by hydramnios and others by a normal quantity of fluid or even oligohydramnios, as is indicated by the report of Eggel. There seems to be no connection between the situation of the tumors upon the placentas and the incidence of excessive amniotic fluid.

SUMMARY

Chorioangiofibromata are very rare solid tumors of a characteristic structure which originate from the connective tissue, epithelium, and blood vessels of the placental chorion. Their etiology and nature are yet uncertain. They have little effect upon the prognosis for the mother, but by their effect upon the production of hydramnios tend to cause premature birth with a consequent high death rate of the children. This excessive production of amniotic fluid with its result upon the fetal mortality is most frequently associated with the larger tumors.

In conclusion I wish to express my thanks to Dr. B. H. Larsson and others for their kind assistance in preparation of the literature. To Dr. J. Whitridge Williams, Dr. F. W. Hartman, and especially to my chief, Dr. E. D. Plass, I am deeply indebted for valuable advice and assistance which has made this study possible.

Since the completion of this article Strachan has published a more detailed description of his tumor in the *British Journal of Obstetrics and Gynecology*, 1923, iii, No. 3, 433-437. Santer also has added an interesting tumor and case report ("Beitrag zur Klinik der Chorionangiome," *Archiv für Gynäkologie*, 1923, cxix, 454-458). He states that he was able to find only 95 of these tumors reported. Other recent articles on this subject have appeared as follows: *R. M. Page*: "Chorio-angioma Case," *Virginia Medical Monthly*, March, 1924, 1, 821. *G.*

Schickelé: "Vraies et fausses tumeurs du placenta," Gynéc. et Obstét., 1924, ix, 50-67. *Robert Meyer*: "Vier Fälle von Placentatumoren," Zentralbl. f. Gynäk., 1923, xlvii, part 1, 157-160.

BIBLIOGRAPHY

- Ackermann*: Festschrift f. Virchow, 1891, i, 612, footnote 33. *Albert*: Arch. f. Gynäk., 1898, lvi, 144. *Alin*: Nord. med. Ark., 1891, i, 1. Ref. *Idem*: Festschr. med. dokt. F. W. Warfvinge, Stockholm, 1894, 217. *Andérodus and Brandies*: Rev. mens. de gynéc., d'obst. et de pédiat., 1910, v, 1. *Auvard*: Bull. soc. obst. et gynéc. de Paris, 1887-1888, p. 261. *Bencke*: Verhandl. der deut. pathol. Gesell.: Berlin, 1899, p. 407. *Bertolini*: Ginecologia, 1910, vii, 503. *Bode and Schmorl*: Centralbl. f. Gynäk., 1895, xix, 922. *Idem*: Arch. f. Gynäk., 1898, lvi, 73. *Böhnke*: Monatschr. f. Geburtsh. u. Gynäk., 1903, xvii, 675. *Brenneke*: Zentralbl. f. Gynäk., 1911, xxxv, 931. *Bretschneider*: Centralbl. f. Gynäk., 1901, xxv, 1316. *Breus*: Wien. med. Wehnschr., 1880, xl, 1093. *Brindeau and Nattan-Larrier*: Rev. mens. de gynéc., d'obst. et de pédiat., 1908, iii, 401. *Briquel*: "Tumeurs du placenta et tumeurs placentaire," 1903. *Buttermann*: Centralbl. f. Gynäk., 1905, xxix, 1423. *Calderini*: Monatschr. f. Geburtsh. u. Gynäk., 1902, xvi, 660. *Cary*: Am. Jour. Obst., 1914, lxix, 658. *Clarke*: Philos. Trans. Royal Society of London, 1798, i, 361. *Colin*: Contrib. à l'étude des tumeurs conjonctives et partie. angiomes du placenta, Lyon, 1905-1906, iv, 44. *Danyau*: Jour. de Chir., 1844, ii, 6. *Dienst*: Ztschr. f. Geburtsh. u. Gynäk., 1903, xlviii, 191. *Idem*: Monatschr. f. Geburtsh. u. Gynäk., 1904, xx, 1052. *Dupin and Chabaud*: Gaz. de hôp. de Toulouse, 1889, iii, 73. *Eggel*: Centralbl. f. Gynäk., 1905, xxix, 1505. *Eike*: Monatschr. f. Geburtsh. u. Gynäk., 1909, xxix, 329. *Elten*: Monatschr. f. Geburtsh. u. Gynäk., 1912, xxxvi, 653. *Engelhard*: Nederl. Tijdschr. u. Verlosk. en Gynaec., 1913-1914, xxiii, 179. *Eras*: Monatschr. f. Geburtsh. u. Gynäk., 1900, xi, 869. *Ferroni*: Ann. di ost. e ginec., Milano, 1905, i, 456. *Fenzi*: Arch. di ost. e gin., Napoli, 1904, xi, 513. *Frühsholz and Hoche*: Bull. soc. d'obst. et gynéc. de Paris, 1913, ii, 390. *Funk-Bretano and Durante*: Gynécologie, Paris, 1908, xii, 506. *Galabin*: Trans. Obst. Soc., London, 1882, xxiv, 107. *Idem*: ibid., 1885, xxvii, 107. *Gheorghiu*: Bull. et mém. Soc. de chir., Bucharest, 1904-1907, vii-x, 16. *Goodhart*: Trans. Obst. Soc., London, 1877, xix, 256. *Gräfenberg*: Ztschr. f. Geburtsh., 1908, lxiii, 537. *Guéniot*: Bull. et mém. soc. obst., Paris, 1888, iv. *Hauser*: Inaug. Diss., München, 1910. *Idem*: Beitr. z. Geburtsh. u. Gynäk., 1911, xvi, 475. *Hildebrandt*: Monatschr. f. Geburtsh. u. Frauenk., 1868, xxxi, 346. *Hodgen*: Brit. Med. Jour., 1879, ii, 370. *Hoehl*: Monatschr. f. Geburtsh. u. Gynäk., 1902, xvi, 259. *Hojnaeki*: Monatschr. f. Geburtsh. u. Gynäk., 1902, xvi, 934. *Hyrtl*: Wien, 1870, p. 121. *Ito*: Ztschr. f. Japan Gynäk. Gesellsch., 1912, vii. *Jeannin*: Le Progrès Méd., 1903, xviii, 417. *Johnstone, R. W.*: Brit. Med. Jour., 1912, ii, 1113-1115. *Idem*: Jour. Obst. and Gynec., British Empire, 1923, xx, 262. *Jotten*: Inaug. Diss., Berlin, 1913. *Kaufmann*: Berlin, 1909. *Kermauner*: Arch. f. Gynäk., 1907, lxxxi, 554. *Köhler*: Wien. klin. Wehnschr., 1918, xxxi, 28. *Kramer*: Ztschr. f. Geburtsh. u. Gynäk., 1890, xviii, 335. *Kraus*: Ztschr. f. Geburtsh. u. Gynäk., 1903, i, 53. *Kummer*: Beitr. z. Geburtsh. u. Gynäk., 1911, xvi, 451. *Labhart*: Beitr. z. Geburtsh. u. Gynäk., 1904, viii, 185. *Lacassagne and Vignes*: Bull. soc. d'obst. et de gynéc., Paris, 1921, x, 208. *Lange*: Deutsch. med. Wehnschr., 1909, xxxv, 1372. *Lazarewitsch*: Course of Obstetrics, St. Petersburg, 1892, ed. 2, ii, 230. *Lehmann*: Monatschr. f. Geburtsh. u. Gynäk., 1900, xi, 478. *Leopold*: Centralbl. f. Gynäk., 1895, xix, 922. *Lewinowitsch*: Ref. Frommel's Jahresb., 1901, p. 810. *Loebl-Rokitansky*: Ztschr. der. k. k. Ges. Aertze, zu Wien, 1844, p. 331: Quoted and tumor re-examined by Breus. *Loennberg*: Hygiea, 1898, lx, 211-222. *Mars*: Monatschr. f. Geburtsh. u. Gynäk., 1896, iv, 229. *Marschak*: "Vier Fälle von Placentartumoren," Inaug. Diss., Breslau, 1906. *Maxwell*: Jour. Obst. and Gynec., British Empire, 1911, xx, 302. *Merttens*: Ztschr. f. Geburtsh. u. Gynäk., 1895, xxxi, 60. *Möller, Lokse*: Ungeskr. f. Laeger, 1919, lxxxi, 1119. *Müller*: Casop. lék. česk., Praha, 1907, xlv, 927. *Nebesky*: Monatschr. f. Geburtsh. u. Gynäk., 1914, xl, 42. *Nicolini*: Ann. Univ. di Med. e Chir., 1882, cclxi, 59. *Niebergall*: Monatschr. f. Geburtsh. u. Gynäk., 1897, vi, 475. *Oberndorfer*: Beitr. z. Geb. u. Gyn., 1901, v, 232. *Ogata*: Ztschr. f. Japan. Gynäk. Gesellsch., 1912. *Orloff*: St. Petersburg, 1897: Quoted by Albert. *Osterloh*: Centralbl. f. Gynäk., 1899, xl, 1232. *Le Page*: Bull. Soc. d'obst. et de gynéc., Paris, 1913, ii, 666. *Pitha*: Annals. de gyn. et d'obst., 1906, lxiii, 232, 269, 360. *Planchu*: Rev. mens. de gynéc., d'obst. et de pédiat., 1912, vii, 521-

524. *Plauchn and Savy*: Arch. mens. d'obst. et de gyn., Paris, 1913, ii, 247. *Pulvirenti*: Policlin., Sez. Chir., Roma, 1909, xvi, 458. *Ravano*: Arch. f. Gynäk., 1908, lxxxvi, 1. *Ribbert*: Ztschr. f. Geburtsh. u. Gynäk., 1915, lxxvii, 205. *Ries*: Am. Jour. Obst., 1904, i, 84. *Roscher*: Monatschr. f. Geburtsh. u. Gynäk., 1920, lii, 325. *Santi*: La Ginec., Firenze, 1904, i, 577. *Schickele*: Beitr. z. Geburtsh. u. Gynäk., 1905, ix, 481. *Schindler*: Arch. f. Gynäk., 1907-1908, lxxxiv, 423. *Schlenska*: "Ein Fall von Placentatumor," Inaug. Diss., Greifswald, 1909. *Schottländer*: Zentralbl. f. Gynäk., 1910, xxxiv, 788. *de Snoo*: Nederl. Tijdschr. v. Verloosk en Gynaec., 1921, xxviii, 204. *Sparapini*: Il Nuovo Ercolani, Pisa, 1913, xviii, 1. *V. Steinbüchel*: Centralbl. f. Gynäk., 1892, xvi, 465. *Storch*: Virchow's Archiv., 1878, lxxii, 582. *Strachan*: Jour. Obst. and Gynec., British Empire, 1923, xxx, 262. *Thaler*: Zentralb. f. Gynäk., 1910, xxxiv, 788. *Theuveny*: Rev. mens. de gynéc. d'obst. et de pédiat., 1910, v, 7. *Trillat*: Bull. soc. d'obst. et de gynéc., Paris, 1920, xix, 220. *Valeri*: Ann. di ostet. e ginec., 1915, xxxvii, 131. *Van der Feltz*: Monatschr. f. Geburtsh. u. Gynäk., 1900, xi, 779. *Viana*: La Ginecolog., Firenze, 1905, ii, 229. *Virchow*: Transl. by Paul Aronssohn, Paris, Balliere, 1867, i, 413. *Williams, J. T.*: Surg., Gynec., and Obst., 1921, xxxii, 523. *Famato*: Ueber den Geschwulstcharakter des Chorioangioma Placentae, Inaug. Diss., München, 1913.

Concerning conditions which were not proved chorioangiofibroma.

Brohm: Beiträge zur Genese der subchorialen Plazentarysten, Inaug. Diss., Heidelberg, 1906 (Chorionic cyst). *Caccio*: Ann. di med. nov., Roma, 1907, ii, 49 (Hydatidiform mole). *Child*: Am. Jour. Obst., 1912, lxx, 852 (Placental polyp). *Commandeur-Lacassagne*: Lyon Méd., 1912, cxix, 541. *Cornil*: Bull. de la soc. anat. de Paris, 1906, lxxxi, 403, 410. (Placental polyp). *Eberth*: Virchow's Archives, xxxix. *Ercolanti*: Sulle malati della Placenta, Bologna, 1871, 543. *Fenomenow*: Arch. f. Gynec., xv, 343 (Chorionic cyst). *Harper*: Lancet, 1852, i, 306. *Mark*: Obst. Soc. of London, Lancet, 1883, i, 678. (Chorionic cyst probably). *Margeson*: Boston Med. and Surg. Jour., 1920, clxxxii, 200. *Ovi*: Monatschr. f. Geburtsh. u. Gynäk., 1904, xix, 777. *Russell*: Monatschr. f. Geburtsh. u. Gynäk., 1901, viii, 538. *Swietochowski*: Ueber die Varizen der Placenta, etc., Inaug. Diss., München, 1910. *Solowij*: Monatschr. f. Geburtsh. u. Gynäk., 1902, xvi, 619. *Walz*: Verhand. d. deutschen path. Gesellsch., 1906, x, 279 (Metastases in Placenta).

References which could not be obtained or verified.

Calori: Mem. dell'accad. delle scienze dell'Ist. di Bologna, Ser. 2, ti, 203. *Canto*: Atti della soc. Ital. di Ostetricia e Ginec., 1913, xviii. *Guzzoni*: Atti. soc. Ital. di obstetr. e gin., xviii. *Hammer*: Zentralbl. f. Gynäk., 1903, xix, 583. *Hodges*: Brit. Med. Jour., 1870. *Lampugni*: Atti de Congresso nazionale di ostetr. e ginec., 1908. *Marduel*: Lyon Méd., 1882. *McDonald and Burnett*: Proc. Path. Soc. Great Brit. and Ireland, 1912-1913, xvii, 112. *Sinclair*: Jour. Gynec. Soc. Boston, 1871, v, 338.

NEPHRALGIA WITH HIGH BLOOD PRESSURE*

BY DEWITT B. CASLER, M.D., BALTIMORE, MD.

(From the Gynecological Clinic of the Johns Hopkins Hospital)

THE term nephralgia has been given to a small but important group of cases, characterized by intense pain in the region of the kidney but without any apparent pathologic cause for the colic. Numerous cases have been reported of renal pain with hematuria, others of hematuria without pain, and to these somewhat allied conditions the various names of essential hematuria, idiopathic renal hematuria and angioneurotic bleeding kidney have been given.

This latter group of cases characterized by pain associated with hematuria, or by hematuria alone has been growing rapidly of late years, as reports have come in from various clinics, but the group of true nephralgias is very small and comparatively few cases have been observed and it is because of the wide divergence of opinion as to the etiology, pathology and treatment of these cases that this report is made.

In January, 1919, the patient, a trained nurse, thirty-four years of age, was admitted to the hospital with acute renal colic. There was a bad family history, the mother having died at the patient's birth with eclampsia, at the age of thirty-three, and the father at the age of forty-six with "kidney trouble." In some few years prior to admission, the patient had had several attacks strongly suggesting angioneurotic edema. Her first attack of renal colic was in 1915, but was mild compared with the subsequent ones and in 1918 she was off duty several weeks with more or less constant pain referred to the left kidney. One of the most striking features of this case was the persistent high blood pressure varying between 240/140 and 200/110 during her stay in the hospital and until the decapsulation of the kidney nearly a year later, and it is an interesting fact that there are almost no blood pressure observations recorded in the nephralgia cases. During her stay in the hospital under medical treatment, every possible test was made to find some pathologic basis to explain her intense colic. There was always a slight trace of albumin and a few casts in the urine. The kidney pelvis were normal in capacity. The functional test of the two kidneys was the same. The x-rays were always negative for stone or neoplasm. The pain during the attacks was constant in the left kidney region and did not tend to radiate. This pain was so severe that it did not yield to morphia in large doses and was controlled only with gas and chloroform. After several weeks under medical treatment, she was able to leave the hospital and resume her duties until October, 1919, eight months later, when on entering the hospital, one morning, to go on duty, she became suddenly blind, and was seized with intense nausea and violent left-sided renal colic. These symptoms rapidly became worse and at times during an attack of pain there would be a complete suppression of the urine lasting as long as 48 or even 60 hours. The colic sometimes stopped as suddenly as it had begun and then there would be

*Read at the Forty-ninth Annual meeting of the American Gynecological Society, Hot Springs, Va., May 15-17, 1924.

excessive voiding, as much as 1500 c.c. being excreted in an hour. This alternate suppression of the urine and excessive voiding made us think that we were dealing mainly with an agnionurosis of the kidney or at least a process in which vascular spasm played an important part.

In the hope of relieving her it was decided to do a decapsulation. When exposed, the left kidney was found to be grayish in color, larger than normal, somewhat adherent to the perirenal capsule, in fact it was the typical large gray kidney of an early interstitial nephritis. The pelvis and ureter were normal. There were two aberrant veins entering the kidney and these were ligated. When a small nick was made in its capsule, the kidney was under such great tension that the capsule split rapidly open for its entire length and the kidney peeled out.

Following the decapsulation the patient recovered rapidly and was able to resume her duties in a very short time. One of the most striking results of the operation was the rapid fall in the blood pressure, the systolic dropping to 150 and remaining at this point until recently, when it has again risen, probably owing to her nephritis.

We have had an opportunity in this case of observing the changes in the left kidney, four years after the original operation. A few weeks ago, this same patient was again admitted with a return of the left-sided renal pain, and these attacks continuing, she was again explored and at the second operation the kidney capsule was found densely adherent and very much thickened, while the kidney itself had changed from the large, gray, soft type to the small, red, contracted or sclerotic kidney of interstitial nephritis. Secondary decapsulation brought about very little effect, the blood pressure dropping for a short time but the old pain returning about three weeks after the second operation.

Etiology.—It has long been recognized that many of the cases in the nephralgia group are associated with chronic interstitial nephritis and many of the kidneys removed for this condition have shown a general interstitial nephritis or nephritis in patches. We know that occasionally nephritis may be confined to one side and is not correctly diagnosed because of the absence of albumin and casts in the urine.

Sabatier, in 1889,¹ was among the first to realize that nephritis was the causal factor in nearly all of the cases of the so-called idiopathic renal haematurias. Then in rapid succession came reports from Israel,² Albarran,³ Rosing,⁴ Zuckerkandl,⁵ Fowler,⁶ and many others endorsing this view.

Bleek,⁷ in 1909, reported on eighty cases of which over fifty showed evidences of true nephritis, while Barringer,⁸ in 1912, out of twenty-five cases in which nephrectomy had been done for idiopathic hematuria found that twenty-three showed a definite nephritis.

In spite of the preponderance of evidence from many authorities as to the nephritic origin of these cases, a second group of eminent urologists, Senator,⁹ Atlee,¹⁰ Guthrie,¹¹ and others, maintain that many of these kidneys show no signs of nephritis at all and that the condition is due to a hereditary hemophilia, although, if this be conceded, it is difficult to understand the relief obtained by operation, and if their hypothesis is correct, we should expect to find these cases occurring earlier in life, rather than at the third and fourth decades, when they are most common.

A third group holds the theory that an angioneurosis is the basic factor in these cases, and that it may play an important part is quite evident from the case here presented with its alternating attacks of anuria and excessive voiding which were unquestionably due to a condition of vascular spasm.

We find reports of still other cases of severe renal colic, cured by appendectomy, although it is difficult to understand just how a diseased appendix could cause a persistent hematuria.

Hunner has had cases of a similar character due to ureteral stricture, while in other instances varices of the renal pelvis, ruptured vessels in the kidney and aberrant veins are occasionally found. Randall,¹² in 1913, argued that a congestion was the principal factor in the etiology, whether caused by nephritis, varicosities or ruptured vessels in the kidney pelvis. The large number of cases recorded, however, seems to prove that the majority of the idiopathic hematurias and nephralgias are due to a one-sided nephritis.

Pathology.—Although opinions differ widely as to the underlying cause of the hemorrhage and pain, there are constantly found gross pathologic lesions other than the changes in the renal parenchyma. Marked thickening of the kidney capsule, dense adhesions about the ureter and inflammatory processes affecting the renal plexus of nerves and its filaments, as they accompany the renal vessels, are quite commonly found.

In a recent paper Papin and Ambard¹³ have described minutely the nerve supply to the kidney and pelvis, and as one considers the elaborate innervation of this organ, with a fine nerve plexus surrounding each of the vessels, even as far as the vascular tuft of the glomerulus and other branches running to the uriniferous tubules, one cannot help but wonder at the infrequency of kidney pains, especially in an organ subject to almost constant activities.

Lennander,¹⁴ is firm in the opinion that the pain in nephralgia is entirely due to pressure within the capsule of the kidney and as proof of this points to the great relief afforded by decapsulation. Israel agrees with Lennander, whereas Senator¹⁵ argues that misplacements, inflammatory adhesions and aberrant vessels are constantly found and that the pain is due to causes other than the congestion and pressure in the capsule.

Geraghty,¹⁶ reporting recently on a series of eighteen cases of nephralgia found no constant lesion and has proposed the name of *idiopathic nephralgia* because of the absence of any definite pathologic lesion. He saw our patient several times in consultation and regards her case as a very unusual one.

Symptoms.—The characteristic symptom in all of these cases is pain, at times dull and aching, at other times sharp, excruciating, and exceeding in certain cases the most severe forms of kidney colic due

to stone. The pain is generally referred to the kidney and may stay confined to it or radiate down the course of the ureter. It may be constant, lasting over a period of many hours, or there may be shorter paroxysms. The bleeding may be intermittent, often occurring without accompanying colic; or it may last over long periods.

Diagnosis.—The diagnosis in these cases is not simple and should be made only after the most painstaking efforts and after every other possible cause for the bleeding and pain has been eliminated. Ureteral stricture, stone in the kidney or ureter, tuberculosis, neoplasm, hydro-nephrosis and pyonephrosis must be excluded. The x-ray and pyelogram, injection of the kidney pelvis, the wax tipped catheter, tuberculin tests and the differential examination of the urine from the two sides are all of value in determining the cause of the hematuria.

When the diagnosis has finally been made by the process of elimination, we still have to decide upon the proper operative procedure.

As diverse as they are in their opinions as to the etiology of nephralgia, just so widely do the various authorities differ in their mode of treatment.

Decapsulation by the Edebohls method, nephrotomy, nephrolysis or freeing of the kidney and ureter of adhesions, adrenalin injections into the pelvis in the bleeding cases, and sectioning of all the nerve trunks supplying the kidney, have been used in various clinics with success. The most widely practiced procedure is the Edebohls decapsulation which has been followed by cures in many instances.

Israel reports numerous cases relieved permanently by nephrotomy, and at times has left the kidney open to heal by granulation.

Geraghty and Frontz have pursued the method of freeing the kidney and ureter of all adhesions as far down as possible, and report a number of cures from this procedure, although here again it is difficult to understand why cases are benefited when the pain is due to congestion and tension of the kidney in its capsule.

Recently, Papin¹⁷ has reported a series of twenty-seven cases, in all of which the pain was permanently relieved by severing the renal nerves. The pedicle of the kidney is exposed, the nerve filaments accompanying the vessels are searched out and torn across, and although the patient suffers much more than after the ordinary kidney operation, the ultimate results in Papin's hands have been excellent.

In conclusion, this paper has been presented in the hope that this unusual case of nephralgia, with its typical nephritis, intense congestion of the kidney in its capsule and its unquestionable attacks of vascular spasm, might help to throw some light on the real etiology of a condition at present little understood. Various methods of treatment have been used with success, but the weight of evidence seems to be that nephrectomy is never justifiable and that the best results

will be obtained by the combined operation of decapsulation and thorough freeing of the kidney and ureter.

Several points in the present case are of great importance; (1) A true angioneurosis may occur, the vascular spasm causing a complete anuria of many hours' duration; (2) congestion plays a large and probably most important part in causing the pain in these cases; (3) decapsulation gives temporary relief, at least in the severe type of nephralgia, and in some instances may effect a permanent cure.

REFERENCES

- (1) *Sabatier*: Rev. de chir., 1889, ix, 62. (2) *Israel*: Mitth. a. d. Grenz. d. Med. u. Chir., 1889, v, 471. (3) *Albarran*: Assn. franc. d'urol., Proc. verb., 1899, iv, 104. (4) *Rovsing*: Brit. Med. Jour., Nov. 19, 1898, p. 1547. (5) *Zuckerkandl*: Wien. klin. Wchnschr., 1905, xviii, 97. (6) *Fowler*: Johns Hopkins Hosp. Bull., 1906, viii, 487. (7) *Bleek*: Beitr. z. klin. Chir., 1909, lxi, 398. (8) *Barringer*: Am. Jour. Urol., 1912, viii, 249. (9) *Senator*: Berl. klin. Wchnschr., 1891, xxviii, No. 1. (10) *Atlee*: St. Barth. Hosp. Jour., Dec., 1901. (11) *Guthrie*: Lancet, London, May 3, 1902. (12) *Randall*: Jour. Am. Med. Assn., 1913, lx, 10. (13) *Papin and Ambard*: Arch. des mal. des reins et des organ. gén. urin., Nov., 1922. (14) *Lenmander*: Mitth. a. d. Grenz. d. Med. u. Chir., 1902, x, 164. (15) *Senator*: Berl. klin. Wchnschr., 1895, xxxii, 277. (16) *Geraghty and Frontz*: South. Med. Jour., June, 1923, xvi, No. 6. (17) *Papin*: Archiv. Fran. Belges de Chir., July, 1923, xxvi, 615, 710.

13 CHASE STREET WEST.

(For discussion see page 652.)

FUNCTION OF THE OVARY*

B. FOURTH PAPER: ADVANCES BETWEEN 1911 AND 1924

BY ROBERT T. FRANK, A.M., M.D., F.A.C.S., DENVER, COLO.

IN the discussion following the reading of my first paper before this Society in 1911, at least three members voiced their doubts concerning the validity of proof offered to substantiate my theme, which was that the ovary is a gland of internal secretion. This uncertainty was, doubtless, due to the fact that the huge mass of evidence and literature, which had accumulated, had proved disconcertingly conflicting. In the thirteen years which have elapsed, much additional evidence has been gathered. I believe that today, I can analyze the various problems at issue with greater lucidity, brevity and convincingness than heretofore. In this brief review I shall refer only to such works and authors as are directly concerned in linking up my chain of proof. Fuller references to the literature can be found in many books and articles of which I instance only Biedl, Wolff, Marshall, etc.¹

My first paper² dealt mainly with the physiology of the sex cycle and afforded additional substantiation of the splendid work performed by Leo Loeb³ in which he showed (a) that the embedding of the ovum necessitated, as a prerequisite,

*Prepared for, but not read at, the meeting of the American Gynecological Society, May 15, 1924, Hot Springs, Virginia.

the "sensitization" of the uterine mucosa by the corpus luteum (formation of deciduomata when irritated by a foreign body, in other words a maternal placental reaction), and (b) that the corpus luteum governed the periodicity of the sex cycle by inhibiting follicle ripening.*

In 1914⁴ I tried to apply to the human subject, with all due reservations, the knowledge gained from physiologic observations and pathologic conditions. The gist of our acquirements showed that although each gland of internal secretion may possess a specific action, this action, if in a given case it does influence the sex sphere, documents itself only in one of two ways by directly reacting upon the ovaries so as to produce either genital hyper- or hypo-function.

In 1917⁵ I offered proof (a) that lipid extracts obtained from the corpus luteum or the placenta could produce massive hyperplasia of the internal and external genital apparatus and of the mammary glands, in castrated animals (for lit. see⁵). I also showed (b) that these results could be obtained in animals deprived of their adrenal, thyroid or pancreas. And finally I drew attention to the fact (c) that the visible increase of mammary gland and nipple in the rabbit offered *in vivo* a convenient pharmacologic test of the potency of ovarian products.

Since then, in 1922⁶ I have published elsewhere results obtained as early as 1917, in which I proved that a similar growth producing effect on the uterus, vagina and breasts could be obtained *by the injection of follicle fluid*. These experiments have more recently been repeated and amplified.⁷ Quite recently Allen and Doisy⁸ have not only confirmed my results, but found that the active principle of the follicle secretion follows the lipid fraction, just as has been shown that it also does in corpus luteum and placental extracts.

The above-mentioned experimental proofs, together with much additional evidence, of which I need mention only the appearance of rut in bitches injected with the blood of rutting bitches (Marshall⁹)—showing the presence of a hormone in the circulating blood; the persistence of rut in ferrets who harbor persistent follicles (Robinson¹⁰)—showing that the follicle secretion maintains estrus; the suppression of estrus in cows while a corpus luteum persists, and the immediate resumption of the cycle when the corpus luteum is squeezed out—showing the inhibiting effect of the corpus luteum—allow us to analyze the sex cycle both in animals and in the human female.

ANALYSIS OF THE SEX CYCLE

(a) *The follicle*, in mammals, elaborates a substance which produces a growth stimulus on the uterus, vagina and mammary glands.

*To whom the credit for determining the function of the corpus luteum is due, has given rise to considerable controversy. The names of Beard (1897), Prenant (1898), Born and later Fraenkel are associated with the first discovery. Fraenkel showed that the corpus luteum is necessary for nidation. His assertion that the yellow body caused menstruation was a fruitful source of confusion and error. Not until Loeb analyzed the two main functions of the corpus luteum was this misconception finally laid to rest.

This effect may occur *in utero*, certainly takes place throughout childhood, and becomes strikingly manifest at puberty. When circulating in sufficient concentration, the follicle hormone causes the pregravid changes known in animals as proestrus and estrus, and in the human female as the "premenstrual" change.

Marshall, 1903,⁹ injecting blood of estrual bitches obtained estrual changes in other bitches.

Bucura, 1907¹¹ found the nutrition of the uterus in a rabbit preserved by a fragment of ovary containing only a few follicles.

Frank, 1922,⁶ showed the pharmacologic effect of injecting fresh follicle fluid.

(b) *The corpus luteum* during its stage of activity, which is far shorter than its actual anatomic persistence (see Loeb) continues and accentuates the growth effect on the uterus, vagina and breasts, thus enabling the genital tract to meet the growth and nutritional requirements of early pregnancy.

As Loeb³ has shown, the ovum is enabled to embed because the "sensitized" uterine mucous membrane reacts to any foreign body by forming the maternal part of the placenta. The nutritional rôle of the glycogen containing decidua may be referred to in passing (Ritter¹²).

The inhibition of follicle ripening during pregnancy, due to the functional persistence of the corpus luteum (Loeb) may be regarded as a conservative measure which prevents follicle waste and inhibits the periodic genital engorgement which might prove disastrous to the growing ovum.

(c) *The placenta*, as has been shown, (lipoid extracts, Iscovesco, etc.,¹³ physiologic, Halban) helps to maintain the continued increase in the growth of the uterus and breast, as initiated by the follicle and corpus luteum, by producing additional muscle hypertrophy in the uterus and gland hyperplasia in the breasts. As an accessory function the placenta inhibits milk secretion (Halban,¹⁴ Frankl¹⁵).

Not only do injection experiments show the effect of the placental action on uterine muscle hyperplasia (see¹²) but clinically the same effect is found in hydatid mole without fetus thus proving that the embryo does not exert this action.

Until a retained placenta is expelled, milk secretion does not take place. Frankl's¹⁵ recent striking experiments on mice confirm this clinical observation.

(d) The sex cycle in the higher apes and in the human female differs somewhat from that of the lower mammals because the function of *menstruation* has developed.

As in other mammals, the follicle secretion initiates the "premenstrual" (better designated as "pregravid") change which consists of the division of the mucosa into the compact and spongy (functional) layers, the basal layer remaining unchanged.

If pregnancy does not occur, the "functional" layers necrose when the corpus luteum becomes functionless, and then exfoliate (Schroeder, Lindner¹⁶). Bleeding, both from the raw surface lining part of the

interior of the uterus, as well as through the intact edematous mucosa, persists as long as the pelvic hyperemia continues. This bleeding is known as menstruation.*

Schroeder¹⁶ has shown conclusively that the exfoliation is not an artefact, by demonstrating it in many excised uteri. Lindner¹⁶ has found fragments of mucosa as a regular content of the menstrual discharge.

Some investigators¹⁷ have tried to explain the menstrual bleeding by changes in the coagulability of the blood resulting from ferment action of the mucosa. These demonstrations are unconvincing.

That the decidual change and uterine hyperplasia is independent of changes in the condition of the pelvic circulation was proved by Loeb³ who obtained the reaction in transplanted uteri by the action of the functioning corpus luteum, as well as by myself⁵ who, upon injecting placental extracts, also obtained hyperplasia of transplanted uterine tissue.

(e) *The periodicity of the sex cycle* after the menstrual function has been established, is governed by the power of the corpus luteum to inhibit follicle ripening. It is not known what factors produce the onset of puberty.

Ablation of the corpus luteum has been shown to shorten the cycle (Loeb), because a new crop of follicles at once begins to develop. As previously mentioned persistence of the corpus luteum postpones estrus. Removal of a corpus luteum at operation is often followed by too early menstruation when the pregravid activation of the mucosa has already taken place, because the nutrition-maintaining influence of the yellow body upon the mucosa is abruptly removed. (Vértes¹⁸).

(f) *Ovulation must occur before the anticipated menstruation*, because only the pregravid uterine mucosa can successfully harbor a fertilized ovum. The dates, as obtained in the human female, both at operation and autopsy, show that ovulation can occur between one to eighteen days after the cessation of the menses (Meyer, Meyer and Ruge, Schroeder,¹⁰ etc.). This signifies that in the human female, in contrast to the lower mammals, the time of ovulation is variable and may fall to within one week of the expected period.

The loss of this fixed relation between ovulation and proestrus (pregravid change) in the human species, might correspond to the fact that in the human female coitus is accepted throughout the cycle.

In animals ovulation bears a fixed relation to estrus, though great differences exist in different species—as a few hours in guinea pig, dog and cow to several months in the bat—and coitus is limited to the time of estrus.

(g) *The interstitial gland* ("puberty gland" of Steinaeh) is inconstant in the same individual (seasonal variations) and absent in many species. Its derivation is ascribed to connective tissue by some (Limon²⁰), to the follicle epithelium by others (Lane-Clayton²¹).

*Marshall (l. c., p. 156) is unwilling to concede that menstruation, according to the old theory of Sigismund (1871), is due to failure of conception. He suggests that the menses may represent "pseudopregnancy degeneration" as well as proestrus destruction "telescoped into one another."

Wallert²² believes that it functions mainly during pregnancy. No convincing proof of its function or importance has been offered.

(h) *A quantitative conception of sex* has been well established by experimental demonstration and clinical observation.

In spite of inherent differences of sex bound to the chromosome (see Goldschmidt²³) maleness or femaleness can be influenced by controllable factors, so that all grades between the complete female, through the intersexual types, to the complete male, have been produced in the lower forms.

Occasionally a true hermaphrodite is observed in the human species (Lacasagne²⁴). Such an individual possesses a bisexual gonad (ovo-testis).

The bisexual anlage of the fetus (male wolffian, female müllerian ducts) respond quantitatively to the hormone developed by their respective gonad, but are unresponsive to the influence of the sex gland of the opposite gender. This is proved by the transplantation experiments of Athias, Steinach, Riddle (see Goldschmidt²³ p. 99).

At times, disease of the glands of internal secretion (especially of adrenal, and epiphysis) produce accentuation of secondary sex characters of the opposite sex such as hirsutes in the female. Whether this change can occur after castration is not determined. Castration produces a neuter condition, which according to the species may approach more to the male or female type.

PATHOLOGIC VARIATIONS

Pathologic variations, though difficult to interpret, have thrown some additional light upon the influence of the ovary.

The ovarian secretion may be completely lacking, may be decreased or increased.

Complete congenital absence of the ovaries is seen only in nonviable fetuses.

Lesser deficiencies produce "fetalism" and "infantilism," but these complexes are not clear because of the participation of the entire organism in these diseases which develop before puberty.

Hypofunctional conditions, in addition to the congenital ones just referred to, may be primary or secondary. They manifest themselves by anatomic hypoplasia of the genitals and poor development or regression of the female secondary sex characters, by amenorrhea, sterility, and dysmenorrhea.

Hyperfunctional conditions, may result from an increased output of follicular or corpus luteum secretion. Clinically we distinguish such complexes as "premature sex development," functional "menorrhagia and metrorrhagia," the "metritic" uterus, the "oversexed" female (if not due to a psychic factor), "functional hemorrhages," etc.

Premature sex development occurs with ovarian tumors in children (Harris, Crowell²⁵) with epiphyseal teratomata (Lenz²⁶) and with follicle ripening during childhood without other observable abnormality of internal secretion.

Increased follicle secretion after puberty, results usually from unknown stimulation, may, but need not, result from the "microcystic" or "polycystic" ovary (for some polycystic ovaries are inactive). The increased and persistent follicle secretion produces the pulsating, "throbby pelvis," the "metritic" uterus, the

violaceous vulva and usually causes menorrhagia or metrorrhagia or both. Scrapings of the endometrium show "stationary hyperplasia."

Robinson¹⁰ has observed protracted estrus in ferrets in which the follicles persisted unduly.

Confusion has arisen from the fact that prolonged bleeding has been found to take place both with and without the presence of a corpus luteum. A persistently functioning corpus luteum (this often does not correspond to an inert, anatomically persistent yellow body) should maintain the nutrition of the "functional layers" of the endometrium and thus stave off menstruation. The marked hyperplasia, with superadded pelvic hyperemia, arising from oversecretion of follicle fluid can account for irregular and protracted uterine bleeding without a corpus luteum in the ovary (see Schickele and Keller, Schroeder,²⁷ Geist²⁸).

Lack of space forbids an attempt at analysis of the effects exerted by the gonad on *metabolism*.

See Murlin and Bailey²⁹ for literature on basal metabolism, McCrudden³⁰ on metabolism of salts, etc. Doncaster³¹ has advanced the theory that metabolism controls sex, not sex metabolism.

CHEMISTRY OF THE SEX HORMONES

Until the lipid extracts were studied, much of the literature was speculative and uncertain.

The earlier investigators contended themselves with using desiccated tissues, press juices or sodium chloride extracts without attempting chemical researches.

The lipochromes, inactive bodies, have been studied (Aschoff, Wallerts³²).

Microchemical studies of the corpus luteum lipoids have been reported by Cicaccio, Miller and others.³³ They have thrown no light on the subject.

Iscovesco¹³ separated the lipoids into various fractions, some proving active, others inactive, but made few analytical studies.

Herrmann¹³ claims to have isolated the ovarian hormone by fractionating corpus luteum substance with lipid solvents and then employing fractional distillation. The resulting oily substance contained 81.33 to 81.62 carbon and 11.32 to 11.49 hydrogen. No formula was produced. The substance appears to be a mixture.

Fränkel and Fonda³⁴ have gone further, using Herrmann's method, and claim that the empirical formula of both the placental and corpus luteum hormone is $C_{32}H_{52}O_2$. They have manufactured derivatives. Their work, though far more searching than that of Herrmann's is not conclusive. They believe that the substance is related to cholesterol, bile acids and bufotalin.

Zondek³⁵ recently reported a growth producing effect of histamin on the uterus. If this observation is confirmed, it is of great importance. Much literature will be found in Marshall.¹

THE ACTION OF OVARIAN EXTRACTS

No two investigators appear to have used exactly the same tests to determine the potency of their preparations. The most popular method has been to employ immature or castrated rabbits and to note whether the organotherapy induced premature sex development in the former or hyperplasia of the uterus, vagina and breasts in castrates.

Lipoids obtained from the corpus luteum and placenta were produced by Iscovesco in 1912,¹³ Aschner,³⁶ Fellner, 1913;¹³ Seitz, Wintz and Fingerhut, 1914³¹; Herrmann, Frank and Rosenbloom, 1915¹³; Fränkel and Fonda, 1923³⁴; Zondek, 1924.³⁵

A lipid was obtained from the follicle fluid by Allen and Doisy, 1924.⁸

None of the preparations, notwithstanding the claims of Herrmann, or of Fränkel and Fonda, appear to contain the active principle in a pure form. All the active preparations, *whether of follicular, corpus luteum or placental derivation*, produced marked hyperplasia of the mucosa and musculature of the uterus, and glandular hyperplasia of the mammary gland, both in immature and castrated animals.

The objection repeatedly has been made that, because a given extract produces growth of the sex organs, this does not prove that this "hormone" represents the *full activity* of the ovary as a gland of internal secretion. The truth of this objection is obvious. It is quite possible that other, as yet unrecognized *part actions* of the ovary do not follow the lipid fraction—I was never able to reproduce Loeb's deciduomata, or to reproduce the "pregnancy" change in the hypophysis, for example, nor have careful investigations on the metabolism of castrates fed with extracts been made—but, as yet, we have no evidence that improvement in the technic of exhibiting active lipid products may not enable us to produce these accessory functions as well as the uterine and mammary hyperplasia.

The effects obtained by some clinicians, upon "flushes" and other vasomotor symptoms of the menopause, upon the uterine hemorrhages, the vomiting of pregnancy, on amenorrhea, sterility and other symptoms, can be accepted as empiric evidence by those so inclined. On the other side, equally creditable gynecologists and obstetricians report negative results. From a scientific point of view, such evidence must be thrown out of court by every investigator who is a physiologist or pharmacologist.

Such chemical and physiologic reactions as are at our disposal, appear to prove that follicle, corpus luteum and placental extracts are identical.

It is well to keep in mind that guinea pigs mature early and ovulate regularly, so that unless castrated, they are uncertain and deceptive as test animals.

Allen and Doisy⁸ employ vaginal smears obtained from rats and mice by the method first recommended by Stockard and Papanicolaou,³⁷ Long and Evans.³⁸ This appears to be a useful method.

The sex *behavior* of animals (acceptance of coitus, actions upon approach of the male and psychical change) are unreliable, as I pointed out in 1911.²

Many other tests have been employed. I might instance the following:

The effect obtained on blood coagulation time, blood viscosity (Wintz,³⁹) toxicity of intravenous injection (Villemain,⁴⁰) etc. These tests must be regarded as nonspecific and in no sense an index of the hormonal activity of the ovary.

The aqueous extracts of Wintz have shown no activity when tested by me (agomensin). This applies as well to his lipid soluble extracts (sistomensin). Abderhalden has prepared ovarian "optones" by tryptic digestion of the gland substance. Such preparations are also physiologically inert.

Using the rabbit's uterus as a test object, I have examined the following ovarian preparations obtainable on the market. Positive results would be signified by visible hyperplasia such as my fresh lipoids produce in a dosage of 25 mg. for four doses. The dosage employed

was from six to ten times that dose, and was given for from six to ten times by injection, or orally, depending on the preparation.

Armour's ovarian substance	neg.
Hynson, Westcott's Lutein tablets	neg.
Burroughs, Welcome "Varium"	neg.
Parke, Davis } ampoules corpus luteum	neg.
} ovarian substance	neg.
Lederle's Corpus Luteum sol.	neg.
Sistomensin "Ciba"	neg.
Agomensin "Ciba"	neg.
Iscovesco's Gynocrinol } Hypo,	neg.
} Mouth tablets	neg.

Geist and Harris⁴¹ have obtained similar results with some of the marketed preparations.

This shows that even those products, which from their method of preparation we would expect to be potent (such as Iscovesco's and Wintz's lipoids), under market conditions lose any potency they might have possessed.

The other products, (i.e., not concentrated) *ab initio* contain so little active substance that even the most optimistic should not expect any potency to be developed, no matter whether defatted, glycerinated or desiccated substance is used. Let me illustrate by the following:

I found it necessary to use 2 kilograms of hog's ovaries to obtain 207 c.c. of follicle fluid. The amount of ether soluble substance was too small to weigh and sufficed only to inject into one rabbit.

Two kilograms of hog's ovaries produced 358 gm. of wet corpus luteum. This supplied 2.7 gm. of very crude lipid extract.

From 5 kilograms of placenta 1.3 to 2 gm. of crude lipid may be obtained.⁷

The usual tablet or ampule now available for therapeutic use contains from 3 to 6 grains of desiccated substance, or the *watery extract* (physiologically impotent) obtained from 5 to 10 grains of ovary or corpus luteum!

I have been reproached with confining my attention to the uterine growth-producing effects of these extracts. I do this because a clear cut pharmacologic reaction results. I refuse as previously mentioned to gauge the effect by the amelioration of such notoriously uncertain symptoms as flushes at the natural or artificial menopause, production of or relief of amenorrhea, and cessation of functional hemorrhages and of vomiting of pregnancy. I marvel at the wonderful clinical results obtained by Graves, J. C. Hirst, Leighton and others but confess that I cannot duplicate them.

Why does it require 50 mg. of corpus luteum lipid extract per kilo of rabbit to produce genital changes, corresponding to the lipid content of 37 gm. of fresh ovaries, when it requires only 3 to 6 daily doses of 5 grains (0.3 gm.) of desiccated corpus luteum to markedly influence the genital sphere of a 50 kg. woman? According to the rabbit dosage it should require approximately 2 kilos of fresh ovary to supply the necessary amount per day! Is the human organism so

hypersensitive to the drug? It will require much more striking proof to convince me of such a physiologic anomaly.

SUMMARY

1. The primary development of the female genital organs, which include the mammary gland, depends upon the *action of the hormone elaborated by the growing follicle*.

2. The corpus luteum hormone produces a periodic accentuation of this effect and prolongs the growth stimulus during the early part of pregnancy.

3. The placenta produces further development of the genital organs in pregnancy.

4. (a) The follicle hormone causes the "premenstrual" or "pre-gravid" uterine change. (b) If no pregnancy develops, as soon as the corpus luteum becomes functionless, the hypertrophic uterine mucosa, analogous to rapidly growing embryonal tissue when the nutrition becomes impaired, breaks down, is exfoliated and bleeding (menstruation) then results.

5. The periodicity of menstruation is due to the fact that after the follicle has ripened—causing the "pregravid" change—ovulation takes place, and the corpus luteum inhibits other follicles from developing until the yellow body grows inactive.

6. Ovulation in the human female has been observed as early as one day and as late as 18 days after the cessation of the menses.

7. No function appears connected with the female "interstitial gland."

8. Sex is a quantitative phenomenon depending upon the character of the gonad and the amount of its hormone output. The male and female tubular systems (wolffian and müllerian) respectively react qualitatively and quantitatively to the male or female hormone.

9. The secondary sex characters may react to other glands of internal secretion in addition to the gonads.

10. Deficiencies in follicle secretion, possibly also in other endocrine glands during the formative periods, produce "fetalism" and "infantilism." When this deficiency first develops after puberty, hypofunction of the genital system results.

11. Excess follicle secretion produces "premature sex development" in infancy and hyperfunction of the genital sphere after puberty has been established.

12. Lipoid extracts of the follicle, corpus luteum and placenta produce marked hyperplasia of the uterus, vagina and breasts in experimental animals (rat, rabbit, guinea pig, cat, etc.).

13. The same dosage per kilo that produces a reaction in animals would necessitate the use of the extract of 2 kg. of ovary per day in the average woman!

14. Therefore it is not surprising that our present methods of ootherapy are ineffective and the results obtained are as yet unconvincing.

BIBLIOGRAPHY

- (1) *Biedl, A.*: Inner Secretion, ed. 2, 1913. *Wolff, B.*: Über Fetale Hormone, Handbuch der Biochemie des Menschen und der Tiere, Oppenheimer, 1913, Fisher, Berlin, Ergänzungsband, p. 442, et seq. *Marshall, F. H. A.*: The Physiology of Reproduction, ed. 2, N. Y. and London, Longmans Green & Co., 1922. (2) *Frank, R. T.*: Surg. Gynee. and Obst., 1911, xiii, 36. (3) *Loeb, L.*: Med. Rec., June 25, 1910, Deutsch. med. Wehnschr., 1911, xxxvii, 17. Jour. Am. Med. Assn., Oct. 30, 1909, liii, 1471. (4) *Frank, R. T.*: Surg. Gynee. and Obst., 1914, xix, 618. (5) *Frank, R. T.*: Ibid., 1917, xxv, 329. (6) *Frank, R. T.*: Jour. Am. Med. Assn., 1922, lxxviii, 181. (7) Work performed and not yet completed together with R. G. Gustavson, Prof. of Chemistry, University of Denver, and Messrs. Lough and Muntweiler, senior students. The work is being done in the chemical laboratory of Denver University and the Experimental Laboratory of the National Jewish Hospital for Consumptives. All repetition with fresh follicle extracts attest its potency. (8) *Allen, E., and Doisy, E. A.*: Jour. Am. Med. Assn., Sept. 8, 1923, lxxxix, 819. (9) *Marshall, F. H. A.*: Phil. Tr. B., 1905, exxvii, 99, part II. (10) *Robinson*: Trans. Roy. Soc. Edin., 1918, p. 52, quoted from Marshall, F. H. A.: Jour. Physiol., 1923, lviii, 74. (11) *Fucura*: Ztschr. f. Heilkund., 1907, xxviii, 147 (N.F., Abt. f. Chir.). and Zentralbl. f. Gynäk., 1913, xxxvii, No. 51. p. 1839. (12) *Ritter, F.*: Ztschr. f. Geburtsh. u. Gynäk., 1910, xv, 226. (13) *Iscovesco, H.*: Compt. rend., Soc. de Biol., 1912, lxxiii, 104. *Fellner, O. O.*: Arch. f. Gynäk., 1913, c, 641. *Adler, B.*: Ibid., 1913, ci, 534. *Herrmann, E.*: Monatschr. f. Geburtsh. u. Gynäk., 1915, xli, 1. *Frank, R. T., and Rosenbloom, J.*: Surg. Gynee. and Obst., 1915, xxi, 646. (14) *Halban, J.*: Arch. f. Gynäk., 1905, lxxv, 353. (15) *Frankl, O.*: AM. JOUR. OBST. AND GYNEC., 1923, vi, 399. (16) *Schroeder, R.*: Monatsch. f. Geburtsh. u. Gynäk., 1914, xxxix, 3. *Lindner, Katie*: Monatsch. f. Geburtsh. u. Gynäk., 1922, lvii, 119. (17) *Cristea, G. M., and Denk, C.*: Wien. klin. Wehnschr., 1910, xxiii, 234. *Sturmdorf, A.*: New York State Jour. Med., 1911, xi, 460. *Meyer-Rüegg*: Arch. f. Gynäk., 1919, cx, 274. *Kross, I.*: Surg. Gynee. and Obst., 1923, xxxvi, 217, also Am. Jour. Obst. and Gynee., 1924, vii, 310. (18) *Vértes, O.*: Gynäk. Rundsch., 1912, vi, 289. (19) *Meyer, R.*: Ztschr. f. Geburtsh. u. Gynäk., 1913, lxxiii, 976. *Meyer, R. and Ruge, H. C.*: Zentralbl. f. Gynäk., 1913, xxxvii, 50. *Miller, J. W.*: Arch. f. Gynäk., 1914, c, 569. *Schroeder, R.*: Arch. f. Gynäk., 1913, ci, 1. (20) *Limon, M.*: Arch. d'Anat. Michose., 1902-3, v, 155. (21) *Lane-Clayton*: Jour. Obst. and Gynee., Brit. Emp., 1907, i, 205. (22) *Wallert*: Arch. f. Gynäk., 1907, 81, 271. (23) *Goldschmidt, R.*: The Mechanism and Physiology of Sex Determination, trans. by W. J. Dakin, London and N. Y., 1923. (24) *Lacassagne, A.*: Gynéc. et Obst., 1920, i, 273. (25) *Harris, R. H.*: Surg. Gynee. and Obst., 1917, xxiv, 604. *Crowell, L. A.*: - South. Med. and Surg., June, 1921. (26) *Lenz, T.*: Arch. f. Gynäk., 1913, xcix, 67. (27) *Schiokke and Keller*: Arch. f. Gynäk., 1912, xcv, 609. *Schroeder, R.*: Arch. f. Gynäk., 1919, cx, 633. (28) *Geist, S.*: Jour. Am. Med. Assn., 1922, lxxviii, 1185. (29) *Murlin, J. R., and Bailey, H.*: Surg. Gynee. and Obst., 1917, xxv, 332. (30) *McCrudden*: Jour. Biol. Chem. 1910, vii, 185. (31) *Doncaster*: The Physiology of Sex Determination. Brit. Assn., 1923, p. 671, quoted from Marshall. (32) *Aschoff, L.*: Ziegl. Beitr., 1910, xlvii, 10. *Wallert, J.*: Beitr. f. Geburtsh. u. Gynäk., 1900, xiv, 149. (33) *Ciccacio, C.*: Centralbl. f. Path. Anat., 1909, xx, 771. *Miller, J. W.*: Arch. f. Gynäk., 1910, xci, 263. (34) *Fränkel, S., and Fonda, M.*: Biochem. Ztschr., 1923, cxli, 379. (35) *Zondek, B.*: Arch. f. Gynäk., 1923, cxx, 251. (36) *Aschner, I.*: Arch. f. Gynäk., 1913, xcix, 534. *Seitz, Wintz, and Fingerhut*: Muench. med. Wehnschr., 1914, lxi, 1657 and 1734. (37) *Stockard, C. R., and Papanicolaou, G. N.*: Am. Jour. Anat., 1917, xxii, 225. (38) *Long, J. A., and Evans, H. M.*: The Oestrous Cycle in the Rat and Its Associated Phenomena. Mem. Univ. of Calif., 6, 1922. Univ. Cal. Press. (39) *Wintz, H.*: Deutsch. med. Wehnschr., 1924, i, 67. (40) *Villemain*: Le corps jaune considéré comme glande à sécrétion interne de l'ovaire, Paris, 1908, O. Doin. (41) *Geist, S. H., and Harris, W.*: Endocrinology, 1923, vii, 41.

CONTRACEPTION: A MEDICAL REVIEW OF THE SITUATION*

FIRST REPORT OF THE COMMITTEE ON MATERNAL HEALTH OF NEW YORK

BY ROBERT L. DICKINSON, M.D., F.A.C.S., NEW YORK CITY

THE medical profession has scant knowledge on which to base advice on control of conception. The gist of what is known is here given, together with an account of the attempts to secure clinical data.

As the objects of the committee were stated in this Journal last March (vol. vii, p. 339), it need only be said here that its scientific investigation of contraception—a section of its study of sterility and fertility—is under the complete medical control of a considerable group of representative physicians; that sponsoring the study was voted for in a questionnaire by the New York Obstetrical Society, and that an endorsement was given by the Public Health Committee of the Academy of Medicine.† This work is deemed to be a complete review of the medical literature; personal inspections of birth control clinics and their records; critical collection of foreign experience and American practice; an agreement on general medical indications; consideration of technique; standards for acceptable case histories and the collection and analysis of these; chemical and animal experimentation, and the setting of (and remuneration for) necessary research problems, laboratory and clinical, bearing on fertility and sterility,—all clinical work, when undertaken here, to be within the interpretation of our law³⁰ that sanctions contraception only “to cure or prevent disease.”

Deeming its most important duty to be the organization of a series of impartial, well-studied clinical tests, and believing that these should be made in responsible institutions, the committee made appropriations of \$300 each to six out-patient departments in order to add to its collection of adequate case records. It is also searching for hospital cases since an inspection was made of the cards in one doctor's office covering more than a thousand patients for whom she had placed the “wishbone stem,” and the finding, in several institutions, histories of serious damage done by this implement. Moreover the committee is trying to overcome the difficulty involved in securing and providing the supplies required in order to study certain claims.

Need of Investigation by the Medical Profession.—The data concerning contraception which can be brought together at this time are only

*Read at the Forty-ninth Annual Meeting of the American Gynecological Society, May 15, 1924.

†The American Gynecological Society, at the meeting at which this paper was presented, voted to appoint a committee to cooperate.

sufficient to indicate on what lines research and clinical tests and records of effects should be undertaken. There is general recognition of the necessity of an inquiry—one that will be exempt from inelination to prove or disprove any particular theory. The subject should be capable of handling as clean science, with dignity, decency and directness, but with due consideration of the danger that certain forms of publication may pander to pruriency and give safety to license.

The medical profession alone can determine many physical questions bearing on structure, function and abnormal or diseased states. In addition to this mechanical side, the various mental and moral

Contraception—American practice

as inferred from the recommendations of 64 New York & Chicago specialists on obstetrics and gynecology (21st), white bar: and from reports from 730 married women, mostly college graduates, dotted bar, Davis, 9a; the two tables combined. More than one method usually recom=
= mended or practiced.

ORDER OF POPULARITY

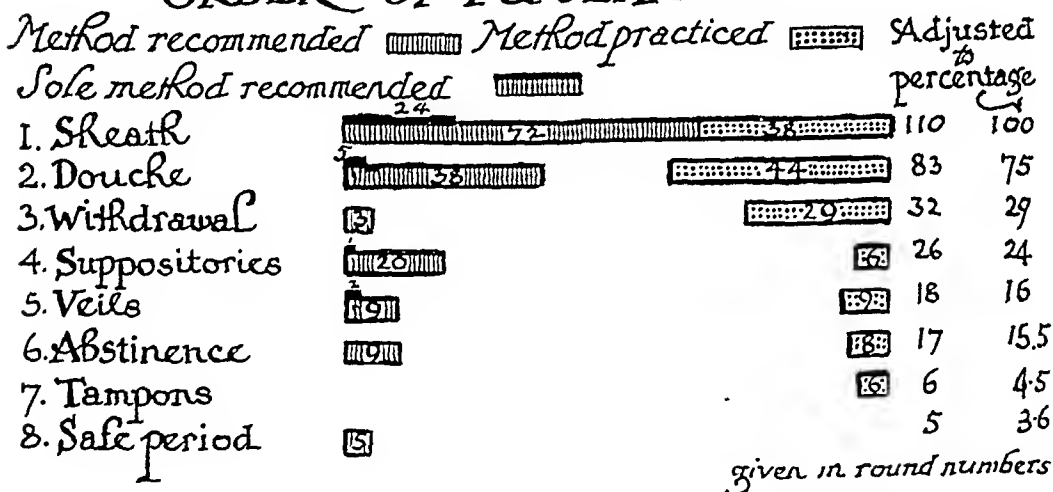


Chart I.

reactions that come chiefly to the knowledge of the doctor, as the father-confessor in matters of sex, should be taken from available records for consideration.

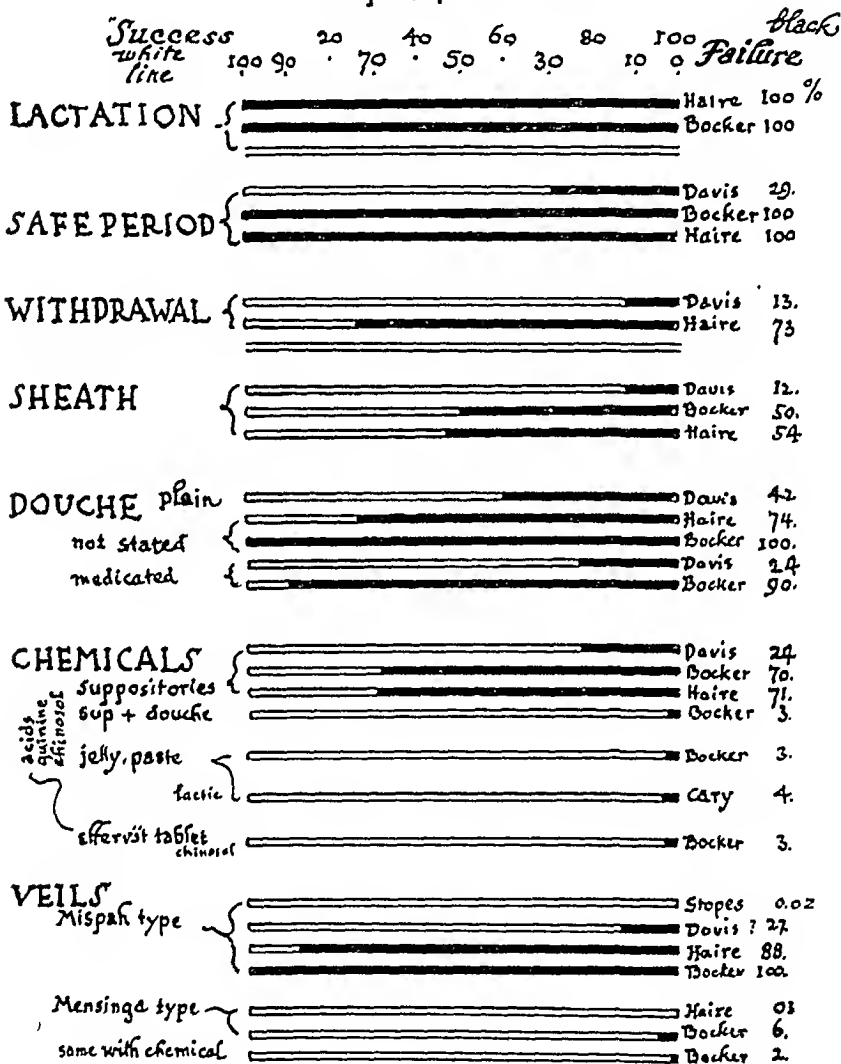
Correlated Studies.—One can attempt, in clinical tests, to set apart the purely medical from the economic considerations involved. This is our present thesis. But this segregation is feasible in part only. The contraception problem forms but one section of a study that must be conducted by a well-balanced group with wide interests,—a group that would take up the interlocking and overlapping problems of fertility and sterility and normal sex life, with the weighty bearing these matters have on individual character, and on family and com-

munity life. The work of the various organizations that are in touch with these questions will need to be coordinated.

Order of Popularity.—A chart has been made from the available figures from Dr. K. B. Davis' 730 educated American women,^{2a} from Dr. Bocker's 1208 clinic patients,³ and from the recommendations of

CHART II CONTRACEPTION: "SUCCESS" AND FAILURE

Bocker, 1208 patients: Cary, 60; Davis, 730; Haire, 1300;
Stapes, 1700.



64 obstetricians and gynecologists of New York and Chicago^{21, 21a} (Chart I). This may be summarized as follows:

With laity, douche and sheath rank as of equal importance, but withdrawal is close to them. Compared with these three nothing else has any standing. The clinic patients have tried lactation as a preventive next in order of frequency, and in a few cases veils, tampons and sponges.

With the doctors the sheath is the outstanding measure; the douche

TABLE 1
METHODS OF CONTRACEPTION

METHODS OF CONTRACEPTION	FAILURES		ADVANTAGES	DISADVANTAGES
	COL- LEGE WOMEN	CLINIC WOMEN		
1 <i>Abstinence</i>	00	00	For the frigid and ascetic?	Nerve strain Infidelity "25 per cent"
2 <i>Lactation</i>		100 per cent		
3 <i>Safe Period:</i> (War, Germany, safety after 21st day)	29	100	Safe for a few women	
4 <i>Withdrawal</i> , coitus interruptus (France); coitus reservatus (Oneida Community)	13	70	Simplicity No apparatus No cleanup	Usually failure of wife's climax
5 <i>Sheath:</i> 2 kinds, rubber, skin, a. tested, lubricated b. douche for break or slip c. combined with chemical	12 fewer "	50	Relative simplicity. Only safety in venereal disease.	Blunting of sensation. Frequent refusal by male.
6 <i>Douche</i> a. plain b. with pressure c. medicated	42 24	100 90	Cleanliness	Not adapted to poor. Mouth of womb not cleared of semen.
7 <i>Chemicals:</i> (acids, quinine, chincol) a. suppositories b. jellies (paste) c. effervescent tablet d. with douche afterward	24 4 4	70 3 3	Simplicity No handicap on sensation	Messy. Best results require douche Not adapted to poor, if douche is to follow
8 <i>Veils:</i> soft rubber vaginal cups a. Mizpah type (snug on cervix) b. Mensinga type (distends upper vagina) c. with chemical d. douche afterward or next morning 8 a <i>Tampons, sponges</i> (medicated)	24	1 to 94 4 2 2 to 6 82	Place safety in wife's own care. No handicap on sensation	Requires careful fitting. Daily removal. Ulceration if neglected.
9 <i>Uterine Stems:</i> a. cervix only b. into body of uterus	some "	some "	Stationary safeguard	Infection not infrequent. Probably abortifacient
10 <i>Sterilization</i> a. cautery-sound strictures at cornua b. tubal excision c. x-ray, radium	some	some	Permanent: Office procedure Insufflation proof of a and b	Few cases tried. Skill required Major operation, done on poor operative risk.

Nos. 4 and 5 place safety measures with the male.
Nos. 6 to 9 place safety measures with the female.
Percentages are drawn from the literature; about 4700 cases.

is ordered half as frequently as the sheath; the suppository is prescribed one-third as often as the sheath and usually supplemented by a douche; veils are recommended by only 6 per cent; withdrawal is condemned by all but four per cent.

On the other hand, the birth control clinics of London^{29, 15} and New York³ are depending largely on the veil; the New York clinic is testing chemicals alone, and the veil plus a chemical; no douche supplements either veil or chemical in these clinics.

The veil, particularly the large form, the Mensinga, seems to have never been given any general test by the medical profession in America.

Order of Safety.—Here we encounter a clash of evidence and opinion (Table I). Combining the specialists on diseases of women and obstetrics and the intelligent American couples, the sheath is the outstanding reliance. With it these couples report failures in 12 per cent; withdrawal shows a little poorer result than the sheath; medicated douches and suppositories and veils exhibit failures among one-quarter of the women reporting, and their plain douche troubles run to 42 per cent.

Conflict in Evidence.—Contrast the above with the record among clinic patients in New York and London in Table I. Taking both cities, this clientele reports failures of the sheath in 50 per cent. Such a discrepancy calls for consideration, for the New York figures cover no less than 507 couples. The difference of experience in safety is no greater than the difference in measures recommended. The three clinics employ chiefly some form of veil, or soft rubber vaginal cups, two of these using shapes that distend the passage high up, while all agree in claiming for them, in series totaling over 4000, less than 5 per cent of failures. In the New York report a chinosol-acid paste or a chinosol effervescing tablet without douche makes nearly as good a showing as the veils, and the combination of veil and chemical claims the best results of all. Douches, alone, though extensively tried among clinic patients, have resulted in failures up to 100 per cent in one series. Vaginal tampons and sponges as protectives have lost credit, and lactation ranks very low.

New Teaching for America.—The clinics, therefore, though they lack counsel from any group which is representative of the medical profession, and though their reports are open to question on several matters, such as bias, reasonably adequate records and follow-up, are developing the general principles of putting the care of the woman into the woman's own care, of fitting a vaginal device to be replaced and removed by her as needed, and of combination of safeguards.

Nothing Less Than Certainty Needed.—Wherever contraception is necessary in order to eliminate serious danger to life or health, no protection protects that ranks lower than one hundred per cent—else fear is not banished, and the penalty of failure is operative

abortion. Therefore the choice lies between total abstinence, or a simple procedure of sterilization (to be employed where there is permanent disability) or a guaranteed technic of contraception not yet worked out.

Penalty of Faults in Technic.—Published studies lack evidence of entry in their records of details essential to success in any technic, yet there is no method in which lack of attention to detail is not likely to result in pregnancy. For example, a means as simple, mechanically, as the sheath, appears to prove, in one private series studied, that the failures are due to lack of lubrication or absence of a douche available when needed, to say nothing of ignorance of the added safeguard of medicated lubricant or preliminary jelly or effervescent tablet.

Adaptation to Individual Needs.—Consideration of the conditions presented by each couple is called for, also medical opinion. As examples, let us note that the sheath and the douche appear to work poorly in the tenement; and that a measure like the veil, if indicated, requires that a doctor first select and fit the device, because of the variations that exist between different individuals in shape and size and position of various internal structures. Indeed, all measures show poorer results in the less intelligent.

Success and Failure.—By “failure” is meant a known pregnancy notwithstanding the uninterrupted use of a particular contraceptive. But it does not follow that the remainder are successes. Dr. Haire and Dr. Boeker both inform us that a patient who does not report is classed as a success. A fifth of the New York patients disappear; only half, in one London clinic, send reports. On the other hand, Dr. Davis’ series show the specific successes. We shall hope to publish series properly classified, grouping those for whom a particular method yielded protection over a given number of years while each deliberate omission resulted in pregnancy, and those wherein protection was afforded for years, and then pregnancy occurred with or without known explanation. Similarly no case should be admitted to the ultimate list of complete successes unless there is adequate evidence that the couple was fertile, and fertile at the period the method was used.

Abstinence.—A special study of the effects will be made.

Safe Period.—This measure, now apparently sanctioned by the Roman Catholic⁴ and Anglican⁵ churches, consists usually in the restriction of intercourse to a period of four to ten days somewhere midway between the periods. Siegel of Freiburg²⁸ studied 320 couples early in the war at a time when German soldiers were only at home two to eight days. The fertilization curve reached its highest point (52 per cent) on the sixth day after the beginning of the period (2 days before the probable rupture of the follicle), remained at nearly

the same height until the twelfth or thirteenth day, then sloped down evenly to the twenty-first, while from the twenty-second to the twenty-eighth day no conception occurred,—the latter in what we infer to be some 11 per cent of the patients.

Sheath.—The sheath maintains its conspicuous place as the best known and simplest measure. It is believed to be trustworthy under four stipulations. These are good quality; testing; lubrication; and a medicated douche (such as one-fourth vinegar) available in case of slip or break. It is very commonly refused by the feebly virile and the selfish. For the careless and the poor it may be of little reliance, but as a preventive of venereal disease it has no competitor. The wholesale cost is from one and a half cents apiece for the rubber to eleven cents for the ceeal.

Withdrawal.—This procedure claims a definite field among the vigorous whose dependable trained control is such that the wife may reach her climax first. The Oneida Community offers no inconsiderable mass of clinical evidence concerning absence of injury with absence of emission.

While the evidence concerning each measure will be taken up in detail in further communications, consideration is given in this article to measures less known in America, or which are the subjects of active discussion at the present time. The largest gap in the clinical reports is on the matter of injury or harm—local, or general, or to nervous system or morals as the result of the use of any or all of these measures.

Chemicals as Contraceptives.—Stopes²⁹ draws attention to the restricted number of chemicals tried, to the matter being largely in commercial hands and to its exploitation in the absence of any scientific study. Haire¹⁵ writes that analyses have shown some commercial preparations to contain none of the drug claimed. Quinine and acid, in gelatine or cocoa butter suppositories, extensively used in England, are now a good deal discredited, because of irregularity in time of softening and consequent uncertainty. The pastes and jellies are to the fore. The preparation is deposited high in the vagina, just before entry.

The longest series of cases is from the Sanger Clinic. Dr. Boeker³ reports 200 cases running 2 to 12 months, using a paste or a jelly of chinisol and acid, with 3 per cent failure; and 200 with a chinisol-acid-effervescent tablet, 2 to 5 months, with the same results.*

Lactic Acid.—Because a high degree of vaginal acidity may cause sterility, Cary⁶ suggested the normal constituent of the vaginal secretion as a contraceptive and advocated 2 per cent as being six times

*She informs us (Aug. 1, 1924) that these measures were not supplemented by a douche and that, used in carefully selected cases, she has now had a total of 837 cases covering 1 to 18 months,—in chinisol pastes, 2 per cent failure,—in tablets 3.2 per cent failure. She deemed combination of tablet or paste with the Mensinga type of womb veil the best method.

stronger than his series of semen tests showed was necessary. He had a proper vehicle worked out, and this is an important item of comfort. A collapsible tube is used with a nozzle and this is capped by a dropping tube bulb (Fig. 9). He orders a douche immediately after emission. An occasional patient complains of burning. His failures in 60 cases have been two.

Animal experimentation by Dr. Isidor Kross,¹⁸ done for the committee on a series of rats and rabbits, by vaginal injection of this lactic acid jelly, showed no effect upon the frequency with which conception occurred.

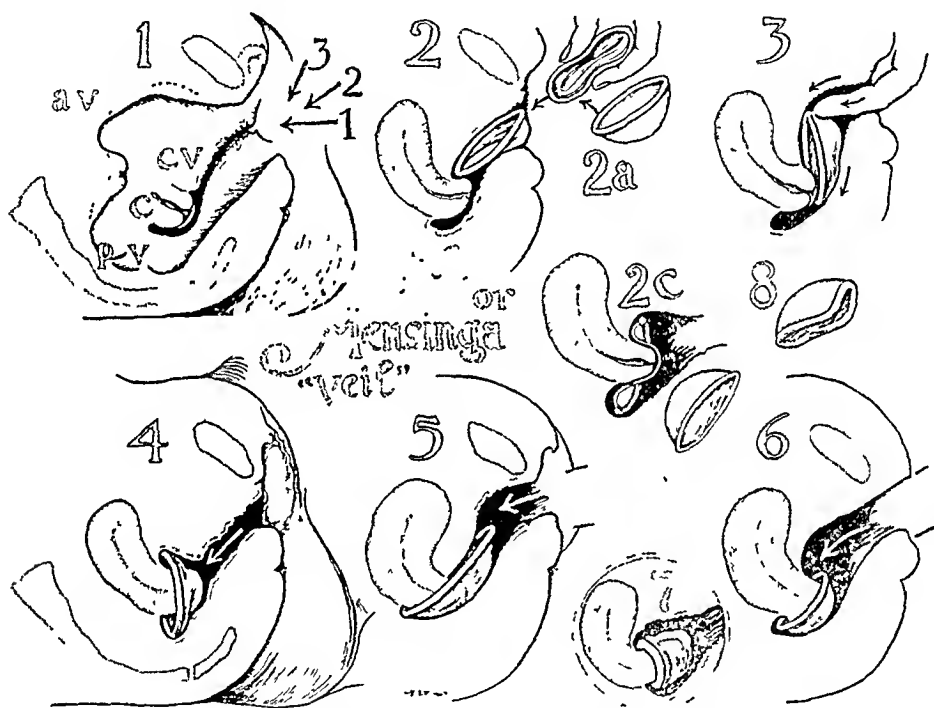
Chinosol.—The outstanding commercialized chemical is oxyquinolin sulphate, an antiseptic more powerful than phenol, but a feeble germicide. It does not coagulate albumin or injure mucous membrane. In some patients 1-2000 causes stinging. It is manufactured under a patent. It is a yellow crystalline powder of saffron-like odor, dissolving readily in water, the aqueous solution having an acid reaction. Ettie Rout,²⁵ working among the Australian soldiers on leave in Paris, sought for an agent deadly to gonococcus and spirochete, and used chinosol because a strength of 1:4000 kills the gonococcus in one minute. A 15 grain tablet, of slow effervescence, (0.2 chinosol) was developed that would stand tropic heat—that would neither be too friable nor too firm. These are the Proseldis Tablets of Harman Freese, Ltd., of London, costing three pence each there. She has only a hundred histories. Pre-kon-sol and Leucorrhoeol are said to contain chinosol. If Dr. Boeker's claims are verified no method compares with this for a combination of simplicity and effectiveness.

MENSINGA VAGINAL CUP PESSARY

Contraindications.—(1) The woman newly married with undilated hymen and vagina. After penetration becomes painless a pessary may be placed, but she will require a larger size when the vagina stretches. The 50 mm. is the smallest diameter ordinarily used. (2) Prolapse, an anterior vaginal wall sagging or with a cervix near the vulvar opening. (3) The inelastic narrow or tubular or very wide vagina. This leaves the cup with its long diameter in the long diameter of the vagina and fails to give protection along the anterior vaginal wall. (4) A cervix out of reach: Women with short fingers and a cervix placed far back in a deep pelvic cavity are physically incapacitated for fitting the cup over the cervix. (5) Some women cannot be trusted to withdraw the cup regularly and cleanse it. These may suffer from ulceration from long continued pressure, endotrachelitis from dammed up secretions, and vaginitis from foulness due to the clogging of the pores of the rubber with secretion.

Procedure.—The original advice was for the doctor to place the patient in the knee-chest position and thus to visually determine the

diameter of the upper part of the vagina and observe the fit of the ring in that widest part of the passage. Then the patient was turned on her back and the fit further studied. The dorsal posture, however, would seem sufficient for the estimate of the proper size. The spring (which does not make strong pressure) should distend with very moderate tension as shown in Fig. 4, and what is most important of all, should lie at a more or less strong angle to the axis of the vagina. Comparison between Figs. 4 and 5 will demonstrate right and wrong positions. Fig. 5 presents a circle which is too large and which therefore can only lie lengthwise of the passage. It would consequently permit entry along the anterior vaginal wall in the direction of the white arrow. On the other hand Fig. 6 shows a cup which



Figs. 1 to 8.—Veils or vaginal contraceptive pessaries. 1, The collapsed compared with the distended vagina. *c.v.*, Collapsed vagina, its front and rear walls in apposition; *c.*, cervix; *a.v.*, anterior vaginal wall in maximal distention in the parous woman; *p.v.*, posterior vaginal wall. Between *av* and *pv* the cervix projects. These outlines are averaged from measurements of seventeen patients in the knee-chest posture. While the tampon in the genupectoral decubitus exhibits this degree of distensibility in most women, this diagram would only be instructive for study of intravaginal rubber diaphragms and phallus action by recalling that in coitus the vaginal distention will be only $1\frac{1}{4}$ inch in diameter. A deep reach will pass either anterior or posterior to the cervix as shown, to about this depth, the male length running very steadily at six to six and one quarter inches. Thus there will never be a vaginal cup needing any such wide span. The three arrows show the direction in this sequence, in which the cup should be passed in, or in which the phallus enters. 2, The spring in the edges of the Mensinga pressed together by the patient to pass the introitus, where it soon pockets in the anterior fornix and is blocked by the cervix. Then 3 shows the maneuver by which the tip is dislodged, through pressure along the anterior vaginal wall well up behind the symphysis. 4, A proper size, set across the vaginal axis and distending the upper vagina. 5, Too large a circle lies in the vaginal axis and exposes the cervix to attack along the anterior wall. 6, Too small a cup permits displacement and entry in front of it. 2a, Shows the "cup" position when a spermicide jelly is to be placed in the cup. 2c, Shows the original "dome" position of Mensinga. 7, The Mispah type of vaginal eup pessary by which, instead of vaginal distention, a snug fit and suction on the cervix is sought. The ring is solid rubber, grooved for the snapping on of a cup of thin rubber. 8, The Matrisalus, like a reversed Smith pessary with a dome of thin rubber, to lift the anterior vaginal wall and thus prevent entry anteriorly. Useful with moderate eystoele.

does not distend the upper part of the vagina, and therefore also leaves an elastic pocket of the inner part of the anterior vaginal wall which the glans may enter and thus over-ride the ring in front. Mensinga and Haire recommend this eup placed as shown in Fig. 2c, but if it is desired to fill the hollow with some chemical paste or jelly in order that the external os may be smeared and protected by such action, it would seem better to keep the concavity downward, Fig. 2a.

Anteflexion of the cervix would seem favorable for the Mensinga, as the cervix points forward. On the other hand a cervix pointing far backward in a long vagina appears not adapted to this protection. Scant imagination is an unfavorable situation. To the poor any means is specially adapted that takes into consideration the inevitable lack of privacy. A device that calls for no evening douche and is removed the next morning qualifies for the conditions. Moreover the protection of the woman is placed in her own hands.

While the Mensinga type (Ramses, Lambutt, Dutch Cap) is supposed to depend upon a fit that distends the wide upper part of the vagina, the Mizpah type (Pro-Raec, Stopes, cheek pessary) is planned to fit snugly over the cervix as shown in Fig. 7. In this diagram the

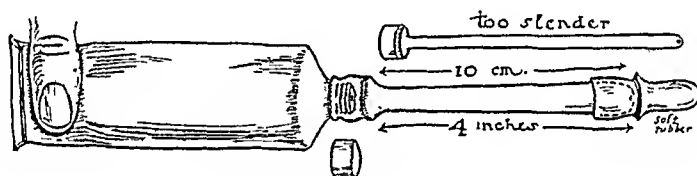


Fig. 9.—Jelly or paste in collapsible tube furnished with nozzle and cap (dropping tube bulb). The nozzle should not be so slender that the urethra could be entered. By keeping the nozzle on the tube, the jelly inside the nozzle does not have to be washed out after each application nor is such quantity wasted.

favorable conditions for such use are indicated in a long and somewhat conical cervix well within the reach of the introitus so that the patient can make sure that a vacuum or suction effect holds the soft rubber ring snugly on the cervix, both before and after coitus.

Where the anterior vaginal wall calls for deeper indentation or uplift to prevent passage of the phallus, the Matrisalus hooded pessary has been recommended (Fig. 8). It has a "turtle-back," an anterior up-curve, like a Smith pessary wrong end foremost. A reversed Hodge with a Mizpah cover is still more effective.

After the proper sized Mensinga has been placed, the patient withdraws or the doctor withdraws and the patient examines herself in order to feel how the cervix projects within the circle of the ring. She must be able to identify this little knob and its position. She then extracts the eup and replaces it herself. Finally the doctor verifies the position.

The patient is instructed to make very sure that she is able to place the ring correctly before she trusts it. She is given a prescription or a collapsible tube of lactic acid jelly or one of the chinosol prepara-

tions and told to use this both as a lubricant and as a filler of the eup to the extent of about a teaspoonful. She is instructed that full protection involves getting up after emission and taking a plain warm water douche, using one-half of the water before removing the womb-veil and one-half of it after its removal, taking care in the second part of the procedure to distend the passage under pressure by holding the external parts together and letting the water come out with a gush.

The veil can be put in place in the afternoon or when dressing for dinner or before retiring. In the Haire and Boeker clinics no douche is ordered and the removal takes place the following morning. The committee's observer, in an inspection in Holland, reports that this is the only measure advised by the women instructed by the New Malthusian League. Following the printed leaflet of Dr. Rutgers,²⁷ they order a douche next morning, part of the fluid to be injected before removing and part after removing the ring. These instructions also specify that before introduction of the pessary the bladder should be emptied.

Figs. 2 and 3 will show the steps by which the woman places the veil, and Fig. 1, 1, 2, 3, shows the directions in which the ring enters in their sequence. She compresses the sides into a figure of 8 shape but is warned that she might break the spring if she collapsed the ring too sharply. She is told that either side up would work and that as long as the mouth of the womb is encircled and projects through the ring and is felt covered with rubber that the ring is in proper position. Also that it cannot slip away, "further up," and "be lost." After it has been lubricated and has been placed within the passage she is told that her finger or thumb must push in along the front wall so as to drive the front part of the circle inwards and even, at first, upwards in order that the further part of the circle may jump across the projecting cone of the mouth of the womb, which is explained and likened to four fingers held together. This step is made quite clear to her as the only trick with which she will have difficulty. Occasionally she needs to be sent home to practice the placements and to return to demonstrate her proficiency. It is found that patients readily learn the method and that but two or three sentences of instruction suffice, fewer words than we have found necessary in explaining processes. The wholesale cost is fifty cents.

Advantages.—As a contraceptive measure the eup appears to present points not to be secured with any other method. Withdrawal, to be sure, interposes no covering at all and brings about complete contacts, but it does not permit of an emission within the vagina and often prevents the wife's climax. This covering of the cervix is said not to interfere with sensation for either partner.

Objections.—The literature contains many cases of damage produced by this instrument. This appears to have been because Men-

singa directed that it should be left in place all the time intervening between the periods. Under these conditions the soft rubber becomes very foul, and the secretions of the cervix are dammed up. Possibly the method has been condemned for what appears not to be inherent in the method. It would seem that daily or frequent removal, cleansing, drying, or boiling, would overcome this objection, and such is the evidence of the two clinics whose main reliance it is.

Further Study.—Because of the extensive use of this measure for forty years in Holland and on the Continent,* and because of the recent commendations from two of the birth control clinics it has been thought important to secure tests in well accredited clinics.

INTRAUTERINE STEMS

Intrauterine stems are divided into two sections, the shorter varieties that stopper the external os and reach in no further than the canal of the cervix and the longer sort intended to spread in the body of the uterus, reaching upward from a button outside the external os.

Cervix Stems.—Cervix stems are relatively uniform in shape and size and resemble a mushroom upside down, or a collar-button. What chiefly holds them in position is the posterior vaginal wall. The first placement is usually by a doctor or midwife. Some patients take them out before a period and have them put back after the period. They are made of hard rubber or aluminum, sometimes of gold or silver. There are very few data to be found concerning these short stems, but it may be guessed that the damage done by them is slight compared with the possibilities of harm producible by stems that enter the body of the uterus. Menstrual fluid and cervical secretion can escape with these shorter devices in place. It would seem likely therefore that semen could enter if fluid can make exit.

Stems that Enter the Body of the Uterus.—The form generally employed is the so-called "wishbone" and is made up of two wires tapering from a Y shape at the top downward as a spiral in the cervix, ending in a metal disc or circle outside the external os. The diameter of the wire is less than one millimeter but the upper end is usually doubled or broadened. The introduction is made by placing the tips in half of a gelatine capsule. The ends spread after the capsule dissolves. The capsule is wet in 5 per cent carbolic acid in alcohol, else it is said to be a not infrequent carrier of infection.

There is a device made of strands of silkworm gut which form a one inch circle for the body of the uterus. These strands are then

*Russia: The head of the Department of Maternity and Child Welfare of Moscow, Dr. Vera B. Lebedev, informed our representative that the Government did not believe in promoting birth control by propaganda, but that they had a commission to study out the best methods and that they had discarded chemicals and taken to mechanical means such as the pessary. They were strong for having everything under medical control, and information given by physicians. Dr. Lebedev's detailed communication has not yet arrived. The Russians are experimenting further with "inoculations of a sperm serum."

wound with silk to make a stem inside the cervix, with a glass button outside (Pust).

The body of the uterus is supposed to exhibit a cavity of a standard shape, namely, a triangle with its base up. This may be likened to a capital letter Y. But actually the cavity, as shown in the casts of the interior (from Guyon, Fig. 10) may have the form of a capital T or I. A wire intrauterine stem of a Y form, its points drawn together to introduce, and the spreading arms released and thrown apart by a spring, will tend to have these arms bury in the lateral walls of the body of the uterus whenever the interior is of the T or I shape.

The outward pressure of these slender wires has been found to act inside the cavity of the body very much as our silver wire or silk-worm gut does when it is used to sew the Baldwin glass stem in place

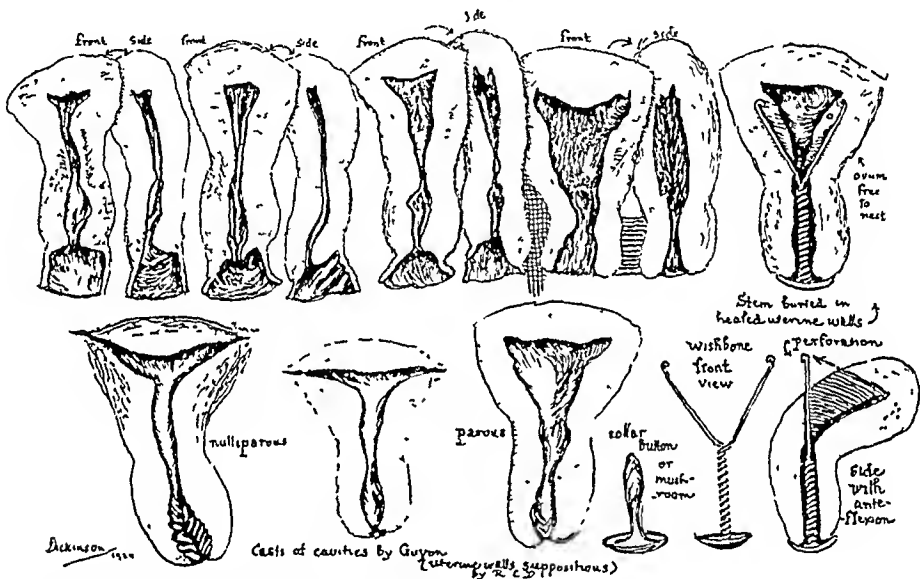


Fig. 10.—The uterine cavity, as shown by casts, and its relation to the intrauterine stem. Note the variety in shape and length and that the "wishbone" or Y-shaped stem, when a misfit, buries, and the ovum beds above it.

by transfixing the cervix high up. Owing to the normal regular uterine contractions these sutures sometimes slowly cut their way down through the cervix, the tissues healing behind them without evident inflammation. Thus the wishbone wires may bury and the lining heal over them. I have apparently found this with filiform and fine probe twice by following up bleeding lateral pockets after removal. After the lining has healed over the wire the ovum may then bed in the endometrium. Both these clinical findings, noted on cases sent in to me for study, were confirmed by the doctor of the largest experience with this form of stem, Dr. Mary Halton of New York, who showed me records of over a thousand cases. Her practice, she said, was to withdraw the "gold pin" at the end of two months, then to sternly forbid intercourse to let the cavity heal, and to reintroduce the instrument.

This "wishbone" has brought about so many abortions and infections that it merits the consideration here given. It has been accused of being protective by producing regular early abortion. We are gathering cases of some of the inflammatory end results and have four in hand, and nine to come, one fatal. I have found two in pregnant uteri; one stem was delivered with the baby, one within the placenta. Dr. Chard discovered one inside a fibroid.⁷

STERILIZATION

Temporary Sterility—Injection of Semen Hypodermically.—Dittler¹¹ and McCartney¹⁹ have produced in fertile pairs of rats sterility varying from a few weeks to thirty, and have found the litters cut in half when conception began again. Haire^{15a} has "experimented with poor success." This is subject for research.

Various observers have studied the effects of *irradiation*. Bailey² a year ago summarized the literature on this subject, and has drawn attention to the danger of the formation of monsters, disturbances in the development of the nervous system, and production of inherited defects in the young. He states that irradiation injures the follicular elements of the ovary. He presents six cases. Pemberton²² brings together thirty-four pregnancies following radiation, and infers that "deformed or undeveloped children are not likely to follow such treatment," but that the chance of miscarriage is increased.

The reimplantation of an amputated tube or temporary burying of the ovary in the inguinal canal has not been studied out.

Permanent Sterilization.—The irrevocability of this choice must be borne in mind. The indefatigable Nürnberger (1917) details the 36 different forms of tubal operations, including tying the tube in a knot. He lists only 6.5 per cent of failures but admits this does not represent the actuality. Rubin's²⁶ inflation tests will soon tell us whether we succeed or not.^{10a} Aldridge¹ has reported three reopenings after five tubal amputations, and Rubin has seen two patencies after sixteen tube sterilization operations.

Several of our members have taken stands on this matter, notably E. P. Davis⁸ and Richard Norris, who look favorably on sterilization, while Chas. C. Norris rarely finds indication for the operation.

The indications for sterilization versus contraception need clear definition and discussion, and will be fully discussed in a later paper. If only decompensated hearts and pronounced tuberculous processes, for example, are now to be considered warrants for sterilization, it may not be forgotten that these patients are not good subjects for laparotomy.

This induced Dickinson¹⁰ (Fig. 11) to study simpler methods than opening the abdomen. Somewhat extensive experience with the nasal cautery electrode in obliterating chronically infected urethral glands,

in destroying nabothian cysts, and shrinking hypertrophied granular cervix surfaces led him into the far corners of the uterine cavity to apply the hot wire loop there and stricture the bristle-sized opening by a circular contracting scar. The earlier cases were before the days of tubal inflation and therefore not proved. Since the gas or air test came in he has had only eight cases. In one lopsided uterus

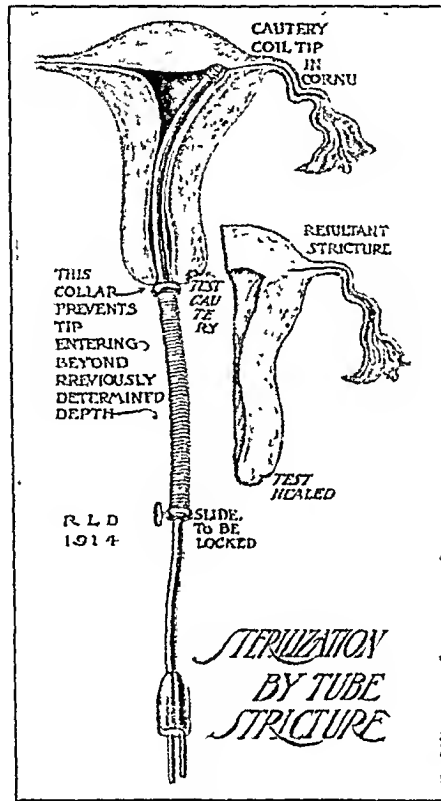


Fig. 11.

he can find but one angle. One other, with a 20 to 30 mm. exit pressure, fails to shut off. The others stand 200 mm. The method is submitted as rational.

BIRTH CONTROL CLINICS

Contraception has been busy reversing the law of survival of the fittest. For fifty years the educated, the thrifty, and the self-controlled have been increasing their precautions to limit their progeny, while toward lessening the indiscriminate breeding of the less fit and its world menace (by giving preventives to the poor) there have been only four systematic attempts.

Holland.—The “Nieuw-Malthusian Band,” under Dr. Rutgers, has for over forty years “trained” women of the lower middle class, for a fee of about six dollars, by a few lessons and a reasonable pamphlet of instruction.²⁷ They fit Mensinga-type pessaries which are to be left in one night at a time, followed next morning, when removing, by a douche given with a large glass syringe. The “Band’s” printed list^{27b}

carries the names and addresses of three doctors, four midwives, and forty-three "practitioners." These are under no supervision by health authorities or the "Band" and decline to make reports to the parent organization. Instruction and pessary and syringe are given to any woman applying, for four to eight guilders (\$1.60-\$3.20), but there are several thousand small-fee members, mostly of the working class, who receive a rebate. The methods observed were none too clean. There is reason to believe that some of these "practitioners" induce abortions if their measures fail. The propaganda is largely on the basis of the economic indication. After delivery each Amsterdam mother receives a circular. The conservative and orthodox would appear to have been antagonized. The Protestant Queen, whose subjects are one-third Roman Catholic, is said by the opposition league²³ to only automatically endorse the "Band" as one among other national societies. The openminded Health Commissioner in Amsterdam stated that the government's attitude is officially neutral, but actually rather against it. There was no contraceptive instruction heard of in clinics or in medical schools.

Of the seventeen gynecologists and eight other doctors interviewed by our investigator, six favor the sheath and eight the vaginal cup, but none claimed for the latter above 75-90 per cent efficacy. Holland's experience therefore is very disappointing in the way of definite information, notwithstanding the propagandists' persistent exaltation of the Lowlands as a paradise of birth control, with "fifty-two clinics," located in "hospitals" and under the aegis of "medical associations."^{7a} Concerning the vote on indications and detailed experiences we shall report later.

London.—The Mother's Clinic, 61 Marlboro Road, was opened March 17, 1920, and reports about 4700 patients up to our investigator's visit in June, 1924. Entirely supported by Marie Stopes, her husband, and the large returns from her books, it is located in a middle-class neighborhood among stores, occupying two tiny rooms in a frame building, but with a pleasant atmosphere. It is open five mornings, three afternoons and one evening a week. Two midwives are on duty, but a woman physician attends once a week, and pathological cases are referred to her. Admission is free, but unmarried women are not accepted and women who have had no child are referred to physicians. For supplies a price list and pharmacists' addresses are furnished. The history calls for scant data and the records seen were not complete. Each patient is given a blank to report results and about one-half do so. The Stopes Pro-Race eup (of French or simplified Mizpah type), has a thick rubber rim and goes on the principle of snug suction fit on the cervix, and not on the idea of distending the fornices. Though in her book Dr. Stopes uses any argument to discredit other forms or methods for ordinary conditions, it was noted in her clinic that a large

sponge with olive oil was ordered, plus a quinine suppository, plus a douche with an enema syringe, but this may have been in a patient with "sagging muscles." The sponge, with vinegar, plus the suppository was also commended for a torn cervix. If the cap does not fit, the sheath is the choice, also for any woman with long vagina and short fingers unable to place the device.

Marie Stopes, Ph.D., is an authority, forceful, eager, critical and discursive. Her book²⁹ covers the ground very completely but also with very complete bias. She stated to our observer that the records of the clinic had not been analyzed but affirmed that she knew of only twenty to thirty failures with the Pro-Race cup. (The Walworth clinic has observed nearly sixty from the Mothers' Clinic.^{15a}) The attendant doctor likes the sponge-covered cup with quinine ointment. This clinic's "Research Council" with some fine medical names, has declined to foster any research,^{29a} though our English interviews brought general commendation of the idea.

The Walworth Women's Welfare Center, 153-A East Street, Walworth, S. E. 17, supported by the New Generation League (formerly the Neo-Malthusian) begun six months later than the other clinic, is in a two-story, frame building in the slums. It is open three afternoons and one evening a week and shows friendly, crisp, intelligent methods, under an upper class social worker superintendent, with an efficient woman doctor, a nurse, and a maid. Everything is scrupulously clean. The charge is one shilling, if able to pay, nothing if not; five shillings if it can be afforded, the pessary at two shillings, sheaths at nine pence. Mail inquiries are answered by a pamphlet. The methods used are about 70 per cent Mensinga, relatively large size (No. 70) combined with a non-greasy quinine ointment, the cup removed next morning, with douche before and after removal. The Matrisalus is fitted where the pelvic floor is relaxed. The sheath is ordered for about 15 per cent. The return visits comprise nearly half the attendance, the total about 225 a month. The record blank cards are excellent. Abortion is refused.

Dr. Norman Haire, who developed this work but is no longer in it, is very intelligent and well posted, but apparently addicted to round numbers.¹⁵ Havelock Ellis speaks well of him.¹² Haire said that he uses a boric-acid-lactic-acid-glycerine preparation for adjuvant to the Mensinga, which is placed dome side up. He stated that most doctors use too large a size, and that the cup is not suitable for torn perineums and retroversions, and that the Rout ehinosol tablets often fail to effervesce.^{15a}

There is said to be a new pay clinic, the Wallace Institute, an offshoot under two women doctors. The views of leading medical men and women will be published later (with names suppressed by

request). The work of Dr. Stopes has brought out many forceful and apt expressions of opinion.

New York.—The clinic run by Dr. Dorothy Boeker next the office of Mrs. Margaret Sanger's Birth Control League began Jan. 2, 1923, in a room fitted up for simple gynecologic work on the upper floor of a business building, at 104 Fifth Avenue, in a loft section. A lay secretary receives patients and excludes all but those married and requiring contraception for the cure or prevention of disease. Five visits on the part of six members of our committee have given an impression of a desire to live up to the law and to stand wide open to inspection. There is alert and vigorous action morning and afternoon, five days a week—and no lack of publicity. Dr. Boeker is particularly well informed on contraceptive matters, and her pamphlet³ is a clear and explicit brief publication. Whatever its imperfections, this work is carried and reported with a research idea—which is novel in propaganda work. The history forms are full and well balanced but the entries often scant. Medical inspection or supervision or check-up must be trifling or absent. For follow-up, they depend on return of patients for the purchase of supplies. Twenty-one per cent fail to return or report.^{3a} The important published results are the successes with a combination of the Mensinga type soft rubber cup (Ramses, Lambutt, Dutch, Haire) and a chemical, or with a chemical alone, ehinosol and acid in paste or effervescent tablet. The chemical has been employed alone largely because the vaginal cup can be obtained with difficulty. This report of twelve months covers 1208 patients with experiments numbering 1558 (but the items total up 1458).

The Voluntary Parenthood League of 19 W. 44th Street, New York, started in 1919, does no case work but is concerned wholly with attempts to alter the Federal law.^{3b} This labels as obscene and forbids transmission by mail and express (or importation) of contraceptive information or devices. The League's collections are \$12,000 this year. The Director is Mrs. Mary Ware Dennett. Its publication is the Birth Control Herald.

Special birth control clinics, widely heralded, may be required at present to furnish legitimate advice not otherwise procurable, and also to gather clinical evidence. But they seem needlessly costly,—let us say, in America, at eight to nine dollars a patient—when our ample obstetrical and gynecological outpatient services might be able to tender this care at seventy-five cents per capita.

The Committee's Experience with Clinics.—In attempting to determine what was the size and character of the problem we opened an office, not for examination or treatment, but for reference and record, supposing that there would be considerable demand,—the diagnosis having been made—to send women to institutions of high standing

for advice. But it was found that an intermediary was little needed inasmuch as most institutions could recognize proper cases and furnish the advice, provided their Trustees and Staff were willing, their doctors knew what to direct, and supplies were available.

It has taken more than a year to get a few leading institutions willing to make the study, to search out what advice is advisable to give them, and to develop supplies. The committee has worked with one nurse to visit settlements and institutions to make inquiries and to follow up, and one stenographer; with a short time library worker; with a doctor who was traveling consenting to undertake our foreign study, while an unpaid medical secretary gave odd times to getting the stuff together and summarized. We have \$4000 toward the \$6000 for local work for the year ahead and are offered for researches in sterility and fertility and for planting clinic studies elsewhere in this country and abroad, a dollar for every dollar we collect for such extension, up to \$10,000 for the year, or a budget of \$26,000 in all.

THE NEED FOR A CLINICAL STUDY OF CONTRACEPTION AND STERILITY— SUMMARY

1. Our search discovers no investigation of "birth control" made in a scientific and ethical spirit and approaching the subject without bias. Review of the literature discloses a library of argument that condenses to a pamphlet of case histories.

2. Wide divergence of opinion exists, largely owing to the meagerness of clinical evidence and to prepossession on the part of observers. For example, opinions gathered by questionnaire from 64 gynecologists vary greatly from the experiences published by the three birth control clinics of London and New York.

3. The committee's investigation carried on in Holland demonstrates that this much quoted paradise of birth control is without clinics or clinical reports or consensus of opinion. Our English interviews show divided counsels, with no checking up of the returns from the two clinics. German authorities urge us to conduct a thorough-going inquiry. Russia is reported as starting some investigation.

4. The medical profession is not yet cognizant of any guaranteed contraceptive. In the very large number of cases where contraception works securely, as well as harmlessly and happily, we shall expect to find a choice rightly adapted to the particular couple, often with two measures combined or in sequence, and above all with attention to detail. It is our business to discover and define such conditions.

5. Sterilization by removal of the uterus prevents future pregnancies. Removal of the ovaries produces a surgical change of life. Both entail definite hazard, particularly to those most needing protection, such as patients with active tuberculosis or rheumatic hearts. Operations on the tubes are under question since the new insufflation tests

show reopenings. This test is now essential after all such operations. The simple, "non-operative" cautery sealing of the tubes is on trial.

6. Irradiation of the ovary calls for further experiment on dosage, on possible damage to future progeny, and risks of abortion.

7. Among ordinary contraceptive devices, some that are found reasonably efficacious among the intelligent are said to fail in half the clinic patients. Yet it is among these that the need is greatest. In one outstanding report from 1000 educated American women, 730 believed in the rightness of regulating pregnancy and practiced it without unduly lessening the number of progeny; in a dispensary series 41 per cent of the women had some knowledge of preventive methods, the restriction (above 4.7 children) being in proportion to their knowledge.¹⁷

8. The one contraception experiment supposed to be carried out on a national scale (the French peasant's withdrawal) has not yet been subject to medical case study regarding its effect on health and reciprocity. The forty year community experiment with coitus reservatus at Oneida was medically studied and the method apparently exonerated.

9. Dependence on the plain douche and any douche alone is largely discredited.

10. Doctors and educated couples in America rely largely on the sheath. One large group shows failure in 12 per cent, whereas among the poor two clinics report 50 per cent failure in extensive series.

11. The use of the sheath calls for testing, lubrication, and ready access to a medicated douche in case of accident.

12. Among chemicals, suppositories make a lesser showing of protection than jellies and pastes and effervescent tablets with chinosol and acids, for which only 3 per cent failure is claimed, covering 837 cases in one clinic report.

13. Infection from stems within the cavity of the uterus is not infrequent.

14. The chief measure which puts the woman's care into her own hands, and is the main recommendation of students of birth control abroad and in this country is that form of soft rubber cervix cup distending the upper vagina which was originally devised by Mensinga, but is not sold here. This device, fitted by a doctor, used for the occasion, and in proper cases, (best combined with a medicated jelly) claims minimal failures and offers case histories. It should receive careful clinic tests—with patients who fall within the law—that is, where contraception is required temporarily or continuously "to prevent or cure disease."

15. In all methods details of technic are found to be of great importance.

16. Where permanent prevention of pregnancy is required, trial

should be made of the relatively simple method of sealing the tubes by the stricture that results from cantery burns of the minute intrauterine openings of the tubes.

17. The data should be collected under competent supervision, the physical questions by properly qualified members of the medical profession. The doctor is the person to select and instruct, because the need must be proved and the recommendations fit individual requirements and particular physical findings.

18. The Committee on Maternal Health, as part of a study of fertility and sterility, has carried on several steps of the investigation of contraception and has under way clinical, chemical and laboratory studies. These, in due time, with proper supervision and adequate professional collaboration and sufficient funds, should secure the facts.

19. The subject is susceptible of handling as clean science, with dignity, decency and directness.

REFERENCES

- (1) *Aldridge, Albert H.*: Insufflation of Uterus and Fallopian Tubes, Report of 600 Cases. Examined by the Rubin Method, AM. JOUR. OBST. AND GYNEC., July, 1923, vi, 53.
- (2) *Bailey, Harold C.*: Effects of Irradiation on Fetal Development, AM. JOUR. OBST. AND GYNEC., May, 1923, v, No. 5.
- (3) *Bocker, Dorothy*: Birth Control Methods, Birth Control League, 104 5th Ave., N. Y., 1924, issued by Research Bureau, part of Mrs. Margaret Sanger's office; monograph of 31 pages, illustrated fully with photographs to scale, with descriptions and with addresses of manufacturers. Tables of 1458 trials on 1208 patients.
- (3a) Visits to clinic and personal interviews.
- (4) *Brown, Mgr. W. F.*: Report of National Birth Rate Commission. The Declining Birth Rate, London, 1917, 2d ed. p. 14, 393, 403, 450.
- (5) *Canterbury, Archbishop of*: Foreword in Florence E. Barrett's Conception Control, Murray, London, 1923, 27 pages.
- (6) *Cary, William H.*: Letters, Nov. 20, 1923, April 11, 1924.
- (7) *Chard, Marie Louise*: N. Y. Infirmary for Women and Children. Personal communication.
- (7a) *Cummins-Vaile Bill*: Joint Hearings before the Subcommittees on the Judiciary, Congress of the U. S. H. R. 6542 & S. 2290, April 8 and May 9, 1924, Serial 38, Washington Government Printing Office.
- (8) *Davis, E. P.*: Complications of Pregnancy, 1923, Discussion Am. Gyn. Soc., 1924.
- (9) *Davis, Katherine B., Ph.D.*: A Study of the Sex Life of the Normal Married Woman, Jour. Social Hygiene, Vol. 8, No. 2, Apr. 1922, Pub. No. 363, also (9a) personal communications.
- (10) *Dickinson, Robert L.*: Simple Sterilization of Women by Catery Stricture at the Intrauterine Tubal Openings, Compared with other Methods, Surg. Gyn. and Obst., Aug. 1916, p. 203-214.
- (10a) Insufflation of Fallopian Tubes by Air and Handbulb. AM. JOUR. OBST. AND GYNEC., November, 1923, vi, No. 5.
- (11) *Dittler*: Muenchen. med. Wehnschr., 1920, lxxvii, 1495; Ztschr. f. Biol., lii, 72.
- (12) *Ellis, Havclock*: Letter and interview.
- (13) *Grotjahn, A.*: Geburten-Ruekgang und Geburten-Regelung, Marcus, Berlin, 1914, 367 pages, many tables, no illustrations, good historical review and references, few technical details concerning methods, very well balanced and scientific, but recommends double condom.
- (14) *Guyon*: Etude sur les cavités de l'uterus à l'état de vacuité: Thèse de Paris, 1858, No. 48; fully illustrated from casts of cavity.
- (15) *Haire, Norman*: East Welfare Centre, Walworth, London, Contraception Technique—A Consideration of 1400 Cases, Practitioner, London, July, 1923, exi, No. 1, 611.
- (15a) Interviews with the Committee's investigator and an Executive Committee member.
- (16) *Halton, Mary*: New York, personal communication.
- (17) *Kahn, Morris H.*: A Municipal Birth Control Clinic, Birth Control Review, Apr. May, 1917; N. Y. Med. Jour., Apr. 28, 1917, 464 dispensary patients.
- (18) *Kross, Isidor*: Letter July 13, 1924.
- (19) *McCartney, J. L.*: Studies on Mechanism of Sterilization of Female by Spermatotoxin, Am. Jour. Physiol., January, 1923, lxxiii, 207.
- (20) *Mensinga*: Fakultative Sterilität; Teil II; Das Pessarium Oclusivum und dessen Application, (seventh edition 1900), second part, ostensibly a hundred cases, but really 49, 34 adequately reported.
- (21)

New York Obstetrical Society, Nov. 1923, Report of Committee on Regulation of Conception, *AM. JOUR. OBST. AND GYNEC.*, March, 1924, vii, No. 3, p. 266, discussion p. 339. (21a) Individual responses to each question have been collated and tables made accordingly, both from Chicago and New York. (22) *Pemberton, F. A.*: Childbearing after Radium and X-ray Treatment, *Surg. Gynec. and Obst.*, August, xxxix, 207-209. (23) *Pinkhof, H.*: Moet de Wekman Nieuw-Malthusian Worden, 1902, Van Rossen, Amsterdam, 19 p. 10 cent: by the President of the Vereeniging ter Bestrijding van het Nieuw-Malthusianisme, the organized opposition to the birth control league; with many prominent names. (24) *Polak, John O.*: *Am. Jour. Obst.*, April, 1919, p. 467. (25) *Rout, Miss Ettie A.*: La belle discretion; publ. by author at 28 Queensboro Terrace, London, W. 2; 130 p., no illus. or statistics; advocates effervescent chinosol 0.2% tablets. (25a) Two Years in Paris, 1923, 52 p. mainly concerned with prevention of venereal disease. (26) *Rubin, I. C.*: A Manometer and Flow-Volumeter for Transuterine Peritoneal Inflation to Determine Patency of Fallopian Tubes in Cases of Sterility, *Am. Jour. of Roentgenology*, August 1921, viii, No. 8, pp. 459-461. (27) *Rutgers, Dr. J.*: Heerenveen, Holland (a) What Every Married Couple Should Know, the Hague, 15 pp. 1917; (b) Printed list of birth control practitioners throughout Holland, Nieuw-Malth. Band, Hoofbestuur, 1923. (28) *Siegel, P. W.*: Freiburg, Wann ist der Beischlaf befruchtend? *Deutseh. med. Wehnsehr.*, 1915, No. 42, 3 Bedeutung des Kohabitationstermines f. d. Befruchtungsfähigkeit der Frau, *München. med. Wehnsehr.*, 61, No. 21. (29) *Stopes, Marie, Ph.D.*: book on Contraception, publ. by Bale, London, 1923: illustrations, history of movement, report of the Mothers' Clinic: an important contribution. (29a) Personal communications and interviews. (30) *Worthington, George E.*: Restrictions on Birth Control; Social Hygiene, 1923, ix, No. 8, p. 458. A full statement of the law, Federal and State. (31) *Hardy, G.*: Question de la population, illustrated book, published by author, 29 Rue Pixerecourt, Paris; fullest consideration in French language, a "free love" point of view and rather indiscriminate endorsement of several measures. Also small illustrated pamphlet in English.

438 WEST 116TH STREET.

(For discussion see page 654.)

ACQUIRED ATRESIA OF THE VAGINA AND CERVIX*

BY FRANK A. PEMBERTON, M.D., BOSTON, MASS.

WE will consider acquired atresia of the vagina and cervix with the understanding that it may be partial or complete. My choice of a title may have been misleading, because atresia means a complete closure, but was due to the fact that we have gotten into the habit of designating atresias as partial or complete in our records.

This subject was chosen because only passing attention is paid to it in most textbooks, whereas we find that it is really of considerable importance in relation to health, marital relations, and sterility.

We will disregard congenital atresia. It is not common and is nearly always accompanied by other defects of development such as absent uterus, double uterus, etc. We will not consider atresias due to new growths and cancer for, although they are common, the major disease is not atresia. The same may be said of the increasing number of atresias following the effects of radium treatment.

Examination of the records of the Free Hospital for Women for the past ten years shows that sixty-seven patients have been admitted to the hospital for troublesome atresias, mostly partial, of the vagina or cervix or both. There are eight in my own private practice, making seventy-five altogether.

It is necessary to classify these cases in some way and then examine them. The anatomic conditions before and after the menopause differ, so we have first separated them into pre- and postmenopause atresias. The normal atrophy of the genitals at the menopause causes a decrease in the size of the genital canal and an increased liability to chronic infections. These two factors, not present in the child-bearing period, play an important rôle in the causation of atresia after the menopause.

We will first consider the etiology of the vaginal atresia occurring in the premenopause age. Inflammatory processes as a cause were found in twelve. Ten had not had children, four of whom were single, and two had borne children. The process consisted of a constriction of part or whole of the vaginal wall in most of these cases, the constriction being in about the middle third of the vagina as a rule. This was due to a dense scar formation, running around rather than along the wall. In two cases only was it complete and in those not constantly, that is, there was drainage at intervals of months. Veit² says that most of these constrictions occur in the middle third of the vagina because that is where the levator ani muscles exert the great-

*Read by invitation before the Brooklyn Gynecological Society, May 2, 1924.

est pressure in holding up the vagina, and their action tends to press the sides of the tube together.

The actual etiology in these cases is difficult to determine. In the six married ones without children the trouble was discovered soon after marriage in all but one case. No previous history of vaginitis was elicited. The same is true of the four single women. In only one was a history of children's contagious diseases obtained. This is the type of case that is supposed to be due to vulvovaginitis in childhood and to the contagious diseases such as scarlet fever and diphtheria. They may also be caused by neglected gonorrheal infections after puberty. It is interesting to note that only two showed any evidence of a pelvic inflammation. One had been operated on a year before for salpingitis and the other eight years before. Another had a macula gonorrhoea but gonococci were not demonstrated. A Wassermann test was not done as a routine on these cases but none gave any history suggesting syphilis. We believe it would be wise to ascertain this point definitely in future. The excised tissue showed chronic granulation and scar tissue, with tuberculosis in none.

In the two who had had children the character of the atresia resembled an inflammatory process rather than a constriction following trauma but no doubt childbirth injuries were a basic factor.

Taussig¹ feels that proof is lacking that vulvovaginitis in children causes these atresias. He believes that if this were a cause strictures of the vagina would be more common and would be found in children. He says that the formation of the hymen shows that there is a tendency for the obliteration of that part of the tract and that therefore it is more probable that these atresias are congenital. King³ answers this by saying, "As to the frequency of these atresias we might also ask why strictures of the male urethra do not occur more commonly."

We feel that the inflammatory etiology is more probable because there seems to be a definite formation of scar tissue in nearly all of them. They occur as a rule above the region of the hymen where the tendency to obliteration would not be likely to play a part. They are not discovered till later in life because complete atresia is uncommon, the vagina being a large tube. It must be remembered also that the inflammatory process may not occur until after puberty. We occasionally see a case that consists of recently formed granulation tissue.

Another cause may be injudicious cauterization of the canal as in the case recently cited by Grad⁴ where a complete atresia of the vagina occurred following the application of nitric acid. Caustic douches may play a part. Sulphonaphthol used in too strong a solution has caused severe burns which might lead to atresia.

It will be noted that no case of atresia of the hymen occurred in this series. Veit² established pretty clearly that those cases which

are congenital are accompanied by other deformities of the genital tract. The ones that occur in utero as a result of adhesions or inflammation are discovered soon after birth because a bulging is noted between the labia. Incision of the hymen releases mucus containing blood and desquamated epithelium. Those discovered at or after puberty are the result of an inflammatory process closing an already small opening in the hymen and are therefore acquired rather than congenital. These cases are not common.

One bizarre case was a woman of twenty-nine who had a ring of condylomata around the introitus of the vagina and around the urethral meatus. She had been happily married until six years before when she began to have dyspareunia and soon could not bear coitus. She was examined by a physician who told her there was nothing the matter. Her husband obtained a divorce from her on the ground that they could not have intercourse. When the writer saw her five years later, she had the condition described, causing an actual partial atresia at the introitus, intense burning at micturition and pain when sitting. The condylomata were of the soft pale type, looking a good deal like normal mucosa, but were very tender, and probably were so small at the previous examination that the physician took them for the remains of the hymen. The patient confessed to no social lapses and from her history it seemed probable that the husband first infected her with gonorrhea. Excision relieved her completely.

The chief complaint in atresias resulting from inflammatory strictures is dyspareunia. The other important one is leucorrhea which is frequently blood stained. There may also be discomfort and pain in the vagina and lower abdomen.

If the atresia becomes complete serious trouble may ensue of which the following case is an illustration:

The patient was forty years old, had been married and was delivered at a normal labor of one child twenty-one years before. She was feeble-minded and a good history could not be obtained. So far as we could ascertain her menstruation had ceased five years before entrance, and pain in the lower abdomen began, which has continued. Probably two years before she came in she began to have bladder symptoms consisting of pain, with incontinence when lying down, and retention while in the upright position. She had some leucorrhea which was not at all marked. She worked until five weeks before we saw her.

The local examination showed an apparently complete atresia of the vagina about half way up. Rectal examination revealed a mass filling the pelvis, globular, smooth, firm, and tender. On introducing a catheter into the bladder about two ounces of thick muco-pus came out, followed by cloudy urine. Irrigation for ten minutes did not clear the bladder enough to make cystoscopy possible.

At ether examination the atresia was found to extend up to the cervix into which a sound was passed for two inches with no outflow of pus. The mass could still be felt and no definite uterus could be outlined. It was thought wise therefore to open the abdomen. The report of the operation is as follows: Median suprapubic

incision through thin anemic tissues up to the umbilicus. A somewhat irregular mass rises above the symphysis and extends to both sides of the pelvis, seeming solidly attached to them. The mass fills the pelvis so that the hand cannot be introduced behind it. What appeared to be a round ligament was seen attached to the right anterior aspect. The mass was taken for a uterus enlarged and deformed, and firmly adherent to the lateral pelvic walls through its chronically inflamed parametria. Removal out of the question. On passing a catheter by urethra the mass was seen to diminish, therefore a further attempt was made to free the mass posteriorly and explore behind it. This caused alarming hemorrhage and was abandoned, as hemorrhage deep behind the mass would be inaccessible. The peritoneum was closed and an extraperitoneal incision made into the mass. This proved it to be a bladder with a wall one-half inch thick, nearly rigid so that it could not collapse, and containing muco-pus and urine. The uterus could not be felt behind this thickened wall. The conclusion was that the entire mass was a greatly thickened and deformed bladder, adherent posteriorly and laterally to the pelvic walls. The kidneys, examined at the beginning of the operation, felt normal. The pathologic examination of tissue removed from the bladder wall showed chronic inflammation with the formation of connective tissue.

We believe that the sequence of events here was as follows: An inflammatory atresia of the vagina occurred with accumulation of secretion behind it which became infected with an organism of weak virulence; the infection spread through the vesicovaginal septum to the bladder with a resulting infiltration of the whole bladder wall and pelvic cellular tissue, in the course of years. The atresia did not remain complete long enough at any one time to cause a dilatation of the uterus; it must have discharged through a sinus at intervals though we could get no history of such an occurrence.

The unusual symptom of retention while erect is explained by the thick muco-pus running to the bottom and blocking the internal meatus while the patient was upright. On the other hand when she was lying down the pus again fell to the bottom, uncovering the meatus, so urine ran out and ran continuously because the rigid wall did not allow the bladder to collapse and distend normally but simply to overflow like a watering trough.

The next common cause of atresias in the pre-menopause stage is the result of plastic operations on the vagina for lacerations. The constriction occurs at the introitus in these cases and is due to making the opening too small in the first place, or to the occurrence of sepsis in the wound with the formation of scar tissue and later contraction of this scar. Two reasons for using interrupted sutures in our plastic work at the Free Hospital for Women are that we get better approximation of the edges with less chance of sepsis and, if a hematoma forms or sepsis occurs, the blood or pus can seep out between the stitches with less damage and scar tissue resulting.

Eight cases in this series come under this heading. The main symptom is dyspareunia, and the treatment enlargement of the opening.

Seven cases seemed to be the direct result of childbirth injuries. In

four there were extensive scars which caused an actual partial atresia and were themselves tender. In three the cervix was adherent to the vaginal walls. One of these had the anterior lip of the cervix adherent to the posterior vaginal wall near the introitus. This was discovered on attempting coitus for the first time after childbirth. The patient was the wife of a physician and he operated on her to release the adhesion. He said that the cervix was so firmly attached so low down on the posterior vaginal wall that he felt sure that it had been inadvertently sutured there by the obstetrical attendant during the postpartum repair of the perineum. When operated on by the writer some years later for prolapse there was an elongation of the anterior lip of the cervix protruding from the vaginal introitus which seemed to confirm his theory, as he had simply released the cervix and had not cut off the elongated lip.

In two cases the partial atresia was at the introitus and was due to atrophy during the artificial menopause, following hysterectomy, the atresia occurring two and three years later. In a third case plasties had been done at the same time as a hysterectomy. Therefore atrophy during the artificial menopause may cause troublesome atresia but it is a relatively rare occurrence.

One case had a tight perineum when forty-one years old, having been married sixteen years without bearing children, for which no definite cause could be assigned.

The premenopause atresias of the vagina are therefore inflammatory, postoperative, and traumatic in origin. The inflammatory ones occur at the middle third, the postoperative at the introitus and the traumatic at both. The actual etiology of the inflammatory cases is difficult to determine but it seems probable that the original infection was gonorrhea in most, either a vulvovaginitis in childhood or a neglected infection later in life. It is an affliction of the poor largely which would seem to be a point against the contagious diseases as a common cause. Acquired atresia of the hymen is not common.

As I have said, conditions after the menopause are changed because the normal atrophy of the genitalia and the increased liability to chronic vaginal infections plays an important part in causing atresia. The increased liability to infection depends on two factors. One is that the reaction of the vaginal secretion changes from acid to alkaline, according to Graves,⁵ and therefore the defense against infection is weakened. The other factor is that the epidermis of the vagina atrophies, becomes thinner, and offers less opposition to invasion by bacteria. The decreased size of the vagina and thin epithelium allow more chance of traumatic injury during coitus with a resulting point of entry for bacteria.

Therefore one of the common and most troublesome diseases of the vagina after the menopause is senile vaginitis. This is a chronic

inflammation of the lining epithelium, characterized by infection which lodges especially around the papillae of the epidermis. You will remember that these papillae carry the blood vessels which nourish the tissue and come up into the underlying connective tissue. The infection gets its foothold at these points, and the stratified epithelium comes off leaving tiny granulating areas which ooze, causing a bloody discharge. Grossly the surface of the vaginal wall appears shiny and smooth, because the rugae have atrophied and flattened out and is slightly to dark red, depending on the severity of the infection. It is dotted with darker red points which are the inflamed papillae. This is an ideal foundation for a more severe inflammation at some point with an atresia as a result.

Gonorrhea may easily cause a vaginitis under these favorable conditions, but it is probably rare at this age, and accounts for very few of these infections. It is a mixed infection of bacteria with a virulence of a low grade.

In this series we find twelve cases which appear to have occurred in this way. The atresias are as a rule higher up than they are in the premenopause inflammatory ones, just below and around the cervix. In four cases the atresia was complete, while in one the opening was only one-half a centimeter in diameter. In the other seven there were adhesions around the cervix between the cervix and vaginal walls, and constriction of the upper part of the vagina. An important point is that three of these cases showed adenocarcinoma of the fundus of the uterus. The chief symptom of the two diseases is bloody discharge, so the finding of a vaginitis or an atresia should not allow one to neglect doing a curettage for a complete examination.

The inflammatory atresias of the vagina occurring after the menopause are more often complete than those before because the vagina is of a smaller caliber and because coitus is less frequent. In our experience the lesion does not extend as deep into the tissues after the menopause. It is more of an adhesion between two surfaces, which can be separated with comparative ease.

Nine cases showed a tight, partially obstructing perineum. In all these cases plastic operations for lacerations had been done before the menopause. The chief cause of the atresia seemed to be the atrophy of the menopause on top of the repair operation. Four of these had an accompanying senile vaginitis. One of the contributing causes of this vaginitis is a perineum so tight that it prevents free drainage of the normal vaginal secretion so that the secretion collects, decomposes, irritates, and macerates the vaginal epithelium which favors infection. The chief complaint is a constant overflow of foul, bloody, irritating discharge, with burning and soreness in the vagina and lower abdomen. The other five had tight perineums which caused dyspareunia.

Two patients had not borne children and complained of dyspareunia after the menopause. Here the trouble was due to a tight perineum caused by the normal atrophy of the menopause. One unmarried woman of fifty-eight noticed that she had a tight perineum and it worried her and made her so nervous that it had to be operated on.

We found eighteen cases of partial or complete atresia of the cervix. Only five occurred before the menopause so it is evident that the atrophic contraction of the cervix occurring at the menopause plays almost the chief part in the etiology. Three of these five had had repairs of the cervix and complained of dysmenorrhea and leucorrhea. The atresia was only partial. The fourth one complained of menorrhagia with bleeding off and on between the catamenia. Examination showed a tight external os due to scar tissue, and dilatation revealed old blood in the uterine cavity, a damming up with an overflow at times. The fifth case had had no period since the instrumental delivery of her baby nine months before, although she had the menses each month. The uterus was the size of a two months' pregnancy. Examination showed an obstructing membrane at the external os. On dilating the canal old blood flowed out, the uterus decreasing in size. This revealed a mass in the pelvis which at operation, done some time later, proved to be chronic salpingitis and not a hematosalpinx.

One of the other thirteen cases had a rather interesting history. She had had her tubes and ovaries removed at thirty-one for tuberculosis. When seen by the writer, thirteen years later, she gave a history of headache of six months' duration, coming for two or three days and going away when a profuse discharge of pus occurred from the vagina at weekly intervals. The examination showed a pin point os which would not admit a fine probe. On forcing a passage and dilating the canal about an ounce of pus was obtained. The curettings showed tuberculosis and at the hysterectomy the general abdomen was found to be entirely negative, the uterus flabby with a dilated cavity.

Of the other twelve cases the outstanding points are that seven had a senile vaginitis, four had cervical polyps, and in three the atresia was complete enough to cause the collection of pus in two cases, and blood in the third in the uterine cavity.

We believe that the atresia in these cases keeps up an endocervicitis and some backing up in the uterine cavity which causes a discharge irritating to the vagina. A senile vaginitis results which will not stay well until the cervix is dilated and treated.

The commonest symptom is bloody discharge, from the associated vaginitis. Such cases are subjected to an ether examination as a routine, to rule out cancer, and the cervical atresia is then demonstrated. The cases with pyometra had sudden, short flows of pus

every two or three weeks and pain in the lower abdomen. The one with hematometra had constant slight bleeding for several months, which was an overflow from the blood backed up in the cavity, although she had had the menopause two years before, at fifty-two years of age. The curettings showed gland hypertrophy, and she was treated with radium. In the other cases the endometrium was usually atrophied. Cancer was found in none. It should be noted that the finding of bloody mucus in the uterine cavity in these cases is almost pathognomonic of cancer of the endometrium.

That atresia of the cervix may result in a serious state of affairs is illustrated by the following case:

The patient was a widow of sixty who had had two children. The menopause occurred fifteen years before. Six months before she was seen she had an acute attack of cystitis with pain in the lower abdomen. Frequent and burning micturition continued off and on with several acute attacks of pain which would lay her up for several days at a time. Five weeks before she had a profuse discharge of pus which she thought came from the vagina. At the time of the consultation she was having great urgency and frequency but passed only small amounts at a time. The examination revealed an irregular mass in the region of the gall bladder and right kidney, which was not very tender. Vaginal examination showed a board-like hardness in the pelvis with an irregular mass in the region of the bladder, about four inches in diameter. This mass was fixed, firm, and tender. The urine was loaded with pus and blood. The examination and urinary findings were those of a tumor of the bladder.

The cystoscopic report is as follows: Bladder capacity six ounces. The lining of the bladder over the trigone and one-half way up to the top is intensely red, edematous and thrown into folds. The right ureteral orifice could not be found. The left ureter was catheterized, injected with iodide solution and x-rays taken. The bladder was filled with barium solution and an x-ray taken.

The bladder urine contained pus and red blood cells. The left ureteral urine was negative.

The x-ray report was as follows: Both kidney shadows are normal in size and position. No calculi are seen in the region of the kidneys, ureters or bladder. The left pyelogram shows a normal kidney pelvis and calices. The lower two-thirds of the left ureter is dilated slightly. The cystogram shows an irregular bladder outline; the superior right and inferior margins reveal a shadow which is smoothly irregular, suggesting pressure from without. The character of the irregularity on the left side suggests an infiltrating growth in the bladder wall. Six rounded, faceted shadows are seen just above the right iliac crest, which are shadows of gallstones and a similar shadow is seen opposite the first lumbar vertebra which is probably a stone in the cystic duct. The x-ray diagnosis was a neoplasm involving the bladder and causing partial obstruction of the left ureter and hydrops of the gall bladder with stones. Ether examination done by Dr. W. P. Graves revealed an atresia of the cervix, with a pyometra.

It seems probable that in this case there was an extension of infection through the uterine wall into the paraeystic cellular tissue, which caused a chronic cystitis and infiltration of the bladder wall so that it could be felt as a tumor.

The treatment of vaginal atresia in general consists in the excision

of the inflammatory or sear tissue, the accurate closure of the wound, if possible, so as to prevent sepsis and more sear, and the maintenance of the caliber of the organ.

The inflammatory atresias of the pre-menopause type usually have a fairly definitely circumscribed area which can be excised. Then the tube is dilated manually. In most of them the vaginal lining can be sutured over the wound. In the others the wound must be kept clean and the dilatation maintained by suitable means to allow it to heal with as little sepsis and contraction as possible, or, if the defect is large and near the introitus, it may be covered by turning in skin flaps from the labia or buttocks. In all cases douches are necessary for clean healing. If it seems necessary to use means to maintain the dilatation we are accustomed to insert a glass plug of suitable size. The patient is kept in the hospital for about three weeks wearing the plug most of the time. She is instructed to wear it at night after she leaves the hospital during four to six weeks longer. This treatment results very satisfactorily.

The treatment of postmenopause atresias due to senile vaginitis is somewhat different. Here the lesion is not as a rule so deep as those which we have just spoken of. It is more of an adhesion of two surfaces together which need to be separated and kept apart until they are healed over. The other principle is to relieve the cause of the vaginitis, the partial atresia of the cervix and the perineum that obstructs free drainage. Therefore the treatment consists in breaking up the adhesions, dilatation of the cervix, and enlarging the introitus to make it funnel shaped, combined with gauze packing to keep the surfaces apart until healed. These patients may need office treatment after leaving the hospital for several weeks until the process is healed and there is no chance of a reformation of the adhesions. Another important point is that to maintain free drainage there should be no redundant folds in the vaginal lining to cling together and act as a dam. Therefore in such cases the excessive lining should be excised. This usually takes the form of a cystocele and rectocele operation, having due regard to not excising too much.

The complete atresias can usually be opened and kept open, especially after the menopause. Occasionally one is seen such as the following:

Married woman, forty-four years old, had had two children, the younger being ten years old. Beginning six months before consultation she did not menstruate for four months. In the next two months she flowed three times for from five to seven days each time, the last one being two weeks before. Two months before, she began to have pain in the lower abdomen which necessitated going to bed for two or three days at a time. She had no nausea, vomiting, fever, symptoms of pregnancy or any molimen during the period of amenorrhea. The examination showed an atresia at the upper part of the vagina with two pinpoint openings which would not admit a probe. At operation the atresia was so firm that it

was felt that the bladder or rectum might be torn into if attempts to get through it were continued. Accordingly a complete hysterectomy was done through the abdomen, thus revealing an atresia of the vagina about two centimeters long, starting just below the cervix. The uterus showed a little retained blood, most of it having been discharged two weeks earlier.

Cases have been reported where the vagina has been destroyed to such an extent that the formation of a new vagina was necessary, but they are rare.

The important point in treating a complete atresia of the hymen is to excise the whole hymen in order to be certain that there will be free drainage, and not to simply incise it which may allow it to obstruct again with great danger of infection. The treatment of the associated hematosalpinx is not standardized. The wall of the tube is thinned out so much that it is very fragile and it is usually adherent to surrounding structures. Its contents are very irritating to the peritoneum and easily infected so there is great danger of sepsis if the tube is torn with escape of the retained blood into the abdomen. If such a case is drained below first there is danger, as the uterus collapses, that enough tension will be put on the tubes to tear them where they are adherent with the escape of the retained fluid. Therefore some feel that it is wiser to do the abdominal operation first. On the other hand, as Graves points out, it is difficult to make a diagnosis of hematosalpinx while the vagina and uterus are dilated. It may be necessary to empty them before a definite diagnosis can be made. Therefore each case must be decided on the findings, remembering that gentle palpation is extremely important.

The technic of enlarging a tight or obstructing perineum is as follows: An anteroposterior incision is made in the middle, of one to two inches in length, half in the vagina and half outside. The skin and mucosa are undermined and the scar tissue, which is nearly always found, is excised and, if necessary, the perineal body is incised, a median episiotomy. Then special attention is paid to stopping bleeding after which the wound is closed from side to side, transversely. Silkworm-gut must be used to obtain a good result because, on account of the tension, the sutures must be left in for eight to ten days. Catgut always causes maceration, the tissues give way, the wound heals by granulation and the patient may be as badly off as before or have a tender scar.

We do not believe that it is generally realized that when plastic operations are done on the vagina at or near the menopause, allowance should be made for the atrophy which is going to occur normally at that time. If the introitus is made small it may shrink enough to cause dyspareunia later. This point applies also when plastic operations and a hysterectomy with removal of the ovaries are done at the same

time. We make it a rule to leave the perineum fairly lax with a funnel-shaped introitus in such cases.

Atresias of the cervix can practically always be treated by dilatation. They may contract again in the course of years but can be dilated when necessary. The type that is resistant to this treatment is that where an atresia has resulted from the use of caustics in the canal. The canal may become obliterated so that it cannot be found from the outside. A sensible operation used by Dartigne⁶ in such a situation is the following: The bladder is stripped back from the front of the cervix up to the uterovesical ligament, or higher as necessary, care being taken not to open the peritoneum. The cervix is incised longitudinally in the middle until the canal is found and an amputation done at a suitable height to remove all the obliterated canal and scar tissue, leaving a patent opening to the uterine canal.

Of the cases reported in this paper forty-seven were operated on by Dr. W. P. Graves, five by various members of the staff of the Free Hospital for Women, and the rest by the writer, who is much indebted to Dr. Graves and the others for permission to use their material.

REFERENCES

- (1) AM. JOUR. OBST. AND GYNEC., iii, 320. (2) Handbuch der Gynäkologie, iii, 210. (3) AM. JOUR. OBST. AND GYNEC., iii, 290. (4) AM. JOUR. OBST. AND GYNEC., vii, 469. (5) Graves; Gynecology. (6) Paris Chirurg. 1922, xiv, 1.

198 COMMONWEALTH AVE.

(For discussion see page 660.)

OCCIPUT POSTERIOR: A CASE ANALYSIS*

By HENRY C. COWLES, M.D., F.A.C.S., NEW YORK, N. Y.

(Attending Obstetrician, New York Nursery and Child's Hospital)

DURING the period of six years from January 1, 1918, to January 1, 1923, there were delivered at the New York Nursery and Child's Hospital 9,374 vertex presentations. Of this number 5,392 or 57.5 per cent were L.O.A.; 2,383 or 25.5 per cent were R.O.A.; 959 or 10.23 per cent were R.O.P.; and 640 or 6.8 per cent were L.O.P. These figures show that 17.05 per cent of the vertex presentations in this hospital are primarily occiput posterior.

The foregoing percentages were derived from patients examined vaginally, and in practically all cases the diagnosis of posterior occiput was confirmed by the attending staff. I therefore believe them to be reasonably correct. A comparison of these figures with those of others is of interest.

Williams,¹ reporting from the service of Johns Hopkins, states that in 5,488 labors the posterior occiput was found 635 times or 11.03 per cent. He believes, however, that at the beginning of labor the incidence is probably twice this figure.

Cragin² found at the Sloane Hospital that occiput posterior occurred in 11.5 per cent of 2,000 cases examined during the first stage, but he believed that at the beginning of labor a figure of 17 per cent would be more nearly correct.

Edgar,³ in 2,200 labors, found the occiput posterior in 89 cases or 4.04 per cent. I interpret his figures, however, to apply to the persistent occiput posterior.

The disparity in the foregoing observations is too small to discuss. It is sufficient to say that at the beginning of labor, the occiput is posterior in nearly one-fifth of vertex presentations, and as a potential of persistent occiput posterior deserves consideration.

Nearly all standard textbooks state that in the *great* majority of occiput posterior cases, anterior rotation will occur at some time during the course of labor. From my personal experience and from the figures I have obtained, I believe the word "majority" should go unqualified. In this series the occiput did not rotate to the front, except with artificial assistance, in 36.8 per cent of the cases.

When rotation takes place the individual case is no different than if the occiput had been anterior from the beginning of labor, except that the time of labor is usually longer, pelvic floor lacerations more extensive, and the intervention of maternal exhaustion and fetal distress more probable. It is the persistent occiput posterior that gives concern, and to determine what an analysis of this type of case would show, I have made the following critical study.

*Read (by invitation) at a Meeting of the New York Obstetrical Society, May 13, 1924.

A series of 312 histories showing an original occiput posterior position was tabulated. Of these, 215 were primiparae and 97 multiparae. The R.O.P. position occurred 178 times or 57 per cent, and the L.O.P. 134 times or 43 per cent; a ratio of 3 to 2. Anterior rotation occurred spontaneously in the R.O.P. group 116 times or 65 per cent, in the L.O.P. group 81 times or 60 per cent, leaving 35 per cent and 40 per cent respectively, persistently posterior; a combined incidence of 36.8 per cent. This figure is three and one-half times larger than that usually given in our textbooks for the persistent posterior position, and I know of no explanation for such a wide discrepancy, unless there be variation in different localities and peoples.

Taking the series as a whole, 312 cases, operative interference was required 105 times or 53 per cent for R.O.P. group of 178 cases, and 78 times or 58 per cent for L.O.P. group of 134 cases. The persistent posterior groups required assistance in all save one case, a persistent L.O.P., an operative incidence of practically 100 per cent; while of the groups which had a spontaneous anterior rotation, the R.O.P. and L.O.P. needed help in 37.9 per cent and 33.3 per cent of cases respectively. This shows that the average high operative incidence of the occiput posterior as a class is confined to the persistent posterior group, where delivery without operation is a rarity.

TABLE I

OPERATIVE INTERFERENCE	R. O. P. 105 OR 53%:	L. O. P. 78 OR 58%
Operative Interference	R. O. P. rotating normally	43 or 37.9%
" "	R. O. P. persistent	62 or 100 %
" "	L. O. P. rotating normally	26 or 33.3%
" "	L. O. P. persistent	52 or 98.1%

TABLE II

METHOD OF ROTATION PERSISTENT POSTERIOR GROUP (115)	R. O. P.	L. O. P.
Scanzoni Maneuver	40 or 64.5%	22 or 41.5%
Manual Rotation	8 or 12.9%	11 or 20.7%
Version	7 or 11.2%	10 or 18.8%

NOTE: 10 cases delivered posterior; 5 rotated during forceps application in mid-pelvis; and 2 were cesarean sections.

Trauma to the pelvic floor is more frequent than in anterior positions, and for the 312 cases, some degree of laceration occurred in 172 cases or 51.9 per cent. These lacerations are more marked as a rule in the cases which must be rotated artificially, but even in the cases that rotate spontaneously the type of tear is often quite characteristic, extending laterally high up into the sulcus from which the occiput turned. Four third degree tears were listed. All were acquired through rapid delivery in the interest of the child. Three were in cases mechanically rotated, and one resulted from a medium forceps in a case which had turned spontaneously.

The maternal morbidity, which includes all cases showing a rise of fever above 100.4° F., unless absolutely proved not to be of obstetric origin, was 20.5 per cent. It was found to be 18.8 per cent for those that rotated and delivered normally; 21.1 per cent for the simple forceps cases; 27.7 per cent for the forceps with manual rotation; 30.6 per cent for the forceps with Scanzoni's maneuver; and 41.1 per cent for the cases of internal podalic version. Fever was transient in the vast majority of these cases listed as morbid, and there was no mortality.

The fetal mortality for the entire series of cases studied was 15, and included one child delivered by cesarean section which died of an intestinal obstruction on the fourth day. This mortality was confined entirely to the persistent posterior group, and, as such, represents a percentage of 14.1 per cent, against an average for the whole hospital service of 4 per cent, not including premature stillbirths.

TABLE III

TYPE OF CASE		MEDIUM FORCEPS WITH SCANZONI	HIGH FORCEPS WITH SCANZONI	VERSION	HIGH FORCEPS PERSISTENT POSTERIOR	MANUAL ROTATION MEDIUM FORCEPS
Fetal Mor-	tality	2	3	6	1	2

Rupture of the membranes was found to occur in the first stage 181 times or 58 per cent, in the second stage 105 times or 33.6 per cent, and in 26 or 8.4 per cent the labor was listed as dry.

The pelves were listed as normal in size and form, in 81 per cent of cases. This figure is based upon the usual methods of pelvimetry, which, alone, I consider inadequate. To the many theories already advanced as etiologically responsible for the posterior vertex, it would be well to consider the factor of abnormal pelvic planes. Without facts, figures or a method with which such can be obtained, and appreciating that a posterior position may occur in one pregnancy and not in a subsequent one, still, I believe that the occiput rests posterior more frequently in that type of pelvis where the plane of inlet makes an exaggerated slant toward the plane of the horizontal. This type of pelvis, which is not rare, undoubtedly favors deflection, and deflection is an unquestioned element in the etiology of a majority of such cases.

It was not my purpose, when I started this study, to take up the management of these cases during labor, but certain statistics so properly belong there that a discussion of their value and application is necessary. The generally accepted division into prophylactic treatment or correction before labor and active treatment or correction during labor is observed. The former, the postural prophylaxis, as described by Reynolds⁴ in his *Practice of Midwifery* (1892), is familiar to all and requires mention only. The application of this prin-

ciple loses value in that relatively few cases of posterior occiput are diagnosed before the onset of labor, and the procedure, which is painful to most patients, when applied is, for the most part, ineffectual.

With the onset of labor our first duty to these patients is to secure dilatation, engagement and spontaneous rotation. Nothing is more effective toward this end than that measure of rest and relaxation which it is possible to secure without actively interfering with the process of labor during the first stage. For this purpose morphine has been widely used. It can be administered alone or in a synergistic combination. Of the latter I believe the insufflation method of Gwathmey⁵ promises much. This type of case, especially where the membranes rupture early or where dry labor frankly exists, furnishes also, at times, one of my very few indications for bags. I agree fully, however, with the findings of Dorman and Lyon⁶ that with such use a decrease in morbidity is not to be expected.

Assuming these three conditions fulfilled, the case becomes an anterior occiput and properly leaves the scope of this paper. The majority can be so managed, but there remains an appreciable percentage, in this series 36.8 per cent, which will require an operative termination, and so will tax the most active ingenuity in deciding which type of operative delivery offers most for the safe conduct of both mother and child. Frequently, other factors enter to further complicate the situation. Dry labor or a very early rupture of the membranes, primary uterine inertia, and an unyielding cervix, singly or collectively, seemingly intrude into nearly every case. Directly, too, as these labors are prolonged, so rises the potential of maternal exhaustion, fetal distress, perineal trauma, hemorrhage and sepsis. Obviously, then, it is impractical to offer more than general suggestions for the management of the persistent posterior case as a class, and futile to say what the individual case will demand.

As previously stated the operative incidence for this series of 115 cases of persistent occiput posterior was practically 100 per cent. The several types of operation were divided as follows: 62 forceps combined with Scanzoni maneuver, 19 forceps combined with manual rotation and 17 internal podalic versions. This leaves 17 cases. Ten of these were delivered posterior, two by cesarean section, and five rotated in mid-pelvis through the veetis action of forceps application. The Scanzoni maneuver so exceeds all other methods of rotation in this series that more than a word of citation seems warranted. Though previously described, this type of forceps rotation was given prominence by Brodhead⁷ in a paper read before this society in 1900. Though universally condemned in the textbooks of that time, this method was given favorable comment in the discussion which followed by Tucker, Cragin and Edgar. Almost the same statement may be made for the textbooks of today, Williams⁸ alone giving this

maneuver his unqualified approval, though placing it secondary to manual rotation. De Lee⁹ mentions it only to condemn it.

This difference of opinion has led me to go minutely into the question and to analyze closely our results. Employed 62 times in 115 cases; 40 of these were persistent R.O.P., and 22 persistent L.O.P. Five stillbirths resulted, a percentage of 8.06, and there were two third degree lacerations of the pelvic floor.

The fetal deaths occurred in difficult forceps deliveries, 3 high and 2 medium, done after long labors, and, in my opinion, the rotation in no way contributed to the result. The third degree lacerations resulted where rapid delivery was imperative in the interest of the child, and were justified by the fact that neither of these children was lost. Twenty-two first degree, and twenty-one second degree perineal tears also were noted, placing the total perineal disruption for this group at 72.5 per cent, a figure 19.2 per cent higher than that in the group where normal spontaneous rotation intervened. A comparison of perineal tears resulting from forceps delivery with the Scanzoni maneuver and forceps delivery as such shows a difference too trifling to discuss.

TABLE IV

		1ST DEGREE	2ND DEGREE	3RD DEGREE	TOTAL
Perineal Lacerations Whole Series	R. O. P. 178	44	44	3	51.1%
	L. O. P. 134	47	33	1	60.4%
Perineal Lacerations Normal Rotation	R. O. P. 116	33	26	1	51.7%
	L. O. P. 81	30	15	0	55.5%
Perineal Lacerations Artificial Rotation	R. O. P. 55	11	18	2	56.3%
	All types L. O. P. 42	17	18	1	85.7%
Perineal Lacerations All forceps without Scanzoni	(102)	30	33	1	62.7%
Perineal Lacerations Forceps with Scanzoni	(62)	22	21	2	72.5%

The maternal morbidity, for the most part inconsequential, was 30.6 per cent against 20.5 per cent for the complete series of cases studied. These figures, plus my personal experience, lead me to the positive opinion that the Scanzoni maneuver, when properly used, is a procedure of definite and certain value, and, though I do not urge its adoption over and to the exclusion of other methods of rotating the occipitoposterior vertex, I am convinced that a more general recognition of its importance is warranted.

Manual rotation is the usual method of choice for converting a posterior into an anterior occiput. Its field of application and technic of accomplishment are so well known that it is unnecessary to review

them further. In this series it was reserved, for the most part, for cases where engagement had not taken place. Most cases of this variety will require an immediate high forceps and prompt delivery. Manual rotation was employed 19 times with a fetal mortality of 10.5 per cent.

Version, with us, has been a last resort procedure in dealing with the posterior occiput case. Usually where delivery by the breech would be otherwise indicated, the patient has been long in labor, the uterus well contracted upon the fetus, the cervix poorly dilated, and the lower uterine segment thin, making a practically impossible condition for this type of delivery. Usually, too, a forceps application has been made which adds materially to the fetal risk. In this group, 17 cases, the fetal mortality was 35.2 per cent and the maternal morbidity 41.1 per cent; figures which speak for themselves, and which bear out the experience of others. Rotation by the two-forceps method is now advocated. I am familiar with this operation only through the literature, and, as yet, have seen no reason to adopt it.

In dealing with the occipitoposterior vertex, is it ever advantageous to deliver the fetal head as a persistent posterior? I believe that it is. Given, for instance, a contracted outlet with wide symphysis and narrow pubic arch, a typical funnel or male type pelvis, and an occiput posterior deeply engaged, this head can be drawn through with forceps, applied properly to increase flexion, and by aid of a deep episiotomy, with less trauma to the pelvic floor and less danger to the fetus than by rotation with forceps, a process which I consider here contraindicated, or manually, which is difficult, if possible at all.

In the occipitoposterior cases we frequently realize too late the existence of a positive indication for cesarean section. By being less conservative on this point and more careful in our preliminary manipulations of the patient, unquestionably many babies could be saved and much suffering, without added risk, spared to the mother. The transperitoneal and extraperitoneal types of cesarean section, by their applicability to the potentially infected mother, have greatly extended the indications for surgical intervention in obstetrics, and, for these procedures, the nonengaging occipitoposterior vertex, offers a particular field.

REFERENCES

- (1) Practice of Obstetrics, ed. 5. (2) Practice of Obstetrics, last edition. (3) Practice of Obstetrics, last edition. (4) Practice of Midwifery, 1892. (5) AM. JOUR. OF OBST. AND GYNEC., 1923, vi, No. 4. (6) Surgical Report of the Woman's Hospital, New York, 1920. (7) Am. Jour. Obst., 1900, xlii, No. 6. (8) Practice of Obstetrics, ed. 5. (9) Principles and Practice of Obstetrics, ed. 3.

27 WEST SEVENTIETH STREET.

(For discussion see page 656.)

AN ENCLOSED BED FOR PREMATURE AND FEEBLE INFANTS*

BY HERBERT J. W. MORGENTHAUER, M.D., BROOKLYN, N. Y.

(From the Gynecological and Obstetrical Department of the Brooklyn Hospital)

THIS bed was designed with the idea of keeping the premature or feeble baby in a protected, portable, adjustable and accessible crib, providing uniformly warmed, suitably humid and well ventilated air, and which would also permit feeding, cleansing and heating of the babe without removal. The bed has been in use at the Brooklyn Hospital for the past year and a half, during which time twenty-five premature or feeble babies were cared for in it, with the loss of but one baby that died ten hours after birth and which was an R.O.P. position. The mother having had a long labor with a premature separation of the placenta. The babies treated in this bed were the smallest and weakest in the nursery at the time. In four cases of premature twins and one of premature triplets the smaller and weaker baby was placed in the bed and this baby averaged better than the others. In fact, in one case, the baby not in the bed lost so much ground it was finally placed beside the other baby and showed a gain almost immediately.

The bed consists of a large compartment, constructed of glass and metal, standing on four castored legs (Fig. 1). The top is a metal roll-top which closes the chamber except for a space at the end directly above the baby's head. At this end, there is an adjustable visor which shields the baby's eyes from the glare of the lights in the room. It runs on a bar which also serves as a handle for the bed. The wiring is concealed under the floor of the bed and the lights are controlled by means of a switch on the front. Our original bed was constructed of wood.

The bed or crib has metal sides and thin springy, steel strips across the bottom to hold the mattress. It is held in place by pegs, one in the center on either side, which rest in notches. By a lock-washer device, the crib can be raised or lowered at either end. The crib is so placed that it divides the large compartment into a lower or heating and moistening chamber and an upper or crib chamber. At the foot of the crib, there is a space through which the chambers communicate and where the thermostat, thermometer and hygrometer are placed.

The lower or heating and moistening chamber is fitted with four electric light bulbs in a line on the center of the floor, equidistant from each other. Circling each light, are seven one-half inch air intake holes, twenty-eight in all, the area of which is equivalent to one large hole eight inches in diameter. By means of two slides, two to twelve of these holes can be blocked off, leaving sixteen holes as the minimum air intake area, this being equivalent to one hole about five inches in diameter. Between the two center lights there is a tank, holding one and a quarter gallons of water with a frame on either side. On these frames, there is a

*Presented, by invitation, at a Meeting of the New York Obstetrical Society, May 13, 1924.

strip of Turkish toweling, the center of which is immersed in the water through a slit in the cover of the tank. The toweling draws the water and is kept saturated, providing a large, constant evaporating surface. The front of the chamber can be opened so that all parts are accessible.

The upper or crib chamber is arranged to allow the utmost ease for the care of the baby and of gradually increasing the degree of exposure. The top can be pushed back and the front opened making for accessibility of the baby. The crib is adjustable. The glass at the head can be opened, as can a slide on either side, thereby obtaining complete exposure of the baby's head.

When the temperature in the lower chamber rises above that of the room, air is drawn into it through the holes encircling the lights. The warmed air rises and



Fig. 1.

is moistened by the saturated toweling above the lights. This now warmed and moistened air, ascends to the mattress and is shunted along to the space at the foot of the crib where it enters the upper chamber. Here, the air passes under the roll-top cover and over the baby making its exit through the space over the baby's head. The baby breaths this warm and moist air. If the glass at the head and the slides on either side are opened an independent circulation of room air passes over the baby's head and mixes with that of the bed so that, towards the close of its premature stage, the baby can be acclimated to room conditions. A further step in this process is obtained by *gradually pushing back the roll-top and opening the front* when complete exposure is obtained. The special features to be noted are as follows:—

1. *Even Temperature.*—The bed is constructed for use in a room of average temperature which is too cool for a premature baby. A temperature, in the cham-

bers of 80° F. to 85° F. has given the best results. When the required temperature is obtained the occasional turning on or off of one or two lights will keep it at that point with very little variation. Where the thermostat is used the temperature is automatically regulated by placing the indicator at the desired point. In our original bed, no thermostat was used, yet very little attention was required, on the part of the nurse, to keep the temperature even.

2. *Humidity*.—For the humidity tests the wet and dry bulb hygrometer was used. The humidity of the air in the chambers will vary from 50 per cent to 65 per cent depending upon the temperature of the bed and the humidity of the outside air. No other premature baby bed, as far as I know, permits of the baby's breathing air of this humidity, in fact, the usual humidity of the air the premature baby breathes is that of the room which, during cold and dry weather, often falls to 30 per cent. I believe one of the main reasons for the success of this bed is due to the normal humidity maintained in the chambers. By this normal humidity, undue absorption of fluids from the baby's skin and mucous membranes is prevented and the initial loss of weight is, in a large measure, curtailed.

3. *Ventilation*.—Since the air in the chambers is drawn from the room through the air-intake holes, ventilation of the bed depends upon that of the room. However, during the airing of the room, the baby is protected from drafts and undue exposure which permits of longer and more frequent airings. One test will suffice to illustrate:—

Temperature before airing, room 78° F., bed 85° F.

Temperature after ½ hour airing, room 60° F., bed 82° F.

A drop of 18° F. in the room temperature with only 3° F. in that of the bed. No thermostat was used at the time of this test.

4. *Acclimation*.—As the baby nears the close of its premature existence, it can be acclimated to room conditions. This is accomplished by gradually reducing the temperature and opening the head, side slides, top and front of the upper chamber. This possibility of opening and closing the bed has been found very useful during hot days and cool nights.

5. *Adjustable Crib*.—The adjustability of the crib has proved useful during feedings and for babies with cyanosis or mucus. Much less regurgitation of food was noted when the head of the crib was raised at feeding time.

6. *Cleansing and treating of the baby without removal from the bed*.—By opening the top and the front, the baby is accessible for cleansings, changings, and treatments without the necessity of removing it from its warm bed.

7. *Sanitation*.—The bed can be easily stripped. The tank, crib and top can be removed and boiled and the remaining four walls can be washed with antiseptic solutions. The wiring and sockets can be readily removed.

8. *Safety*.—This bed is foolproof. The temperature cannot rise sufficiently to harm the baby. There is no danger of burns or suffocation.

9. *Simplicity*.—There is a minimum amount of work required, on the part of the nurse, in caring for the bed. Daily filling of the tank with water, apart from the usual care of premature babies, is all that is required. Hot water bags and hot blankets are dispensed with. There is no complicated mechanism to get out of order.

10. *Economy*.—After installation, the only cost is for current, and an occasional electric bulb and Turkish towel.

911 BEDFORD AVENUE.

CONTRACTIONS OF THE PELVIC OUTLET NECESSITATING DELIVERY BY CESAREAN SECTION*

By EMERSON L. STONE, M.D., NEW HAVEN, CONN.

(*Department of Obstetrics and Gynecology, Yale School of Medicine*)

THE management of labor in cases of funnel pelvis will depend primarily upon the degree of contraction, although Newell has rightly emphasized a preliminary consideration of the size of the child, the ordinary malpositions such as posterior occiput, the age and psychic status of the patient, and other incidental features such as a previous extensive perineal operation. Moderate degrees of transverse contraction, in which the bituberal diameter measures more than 7 cm., are often corrected by an exaggeration of the posture which patients are accustomed to assume toward the end of the expulsive stage of labor. As the thighs are drawn up toward the abdomen and spread apart, the innominate bones rotate about the sacrum in such a way as to increase notably the capacity of the inferior strait. The most extreme lengthening of the posterior sagittal diameter thus obtained occurs when the patient is placed in the lithotomy position, and at times the posture assumed for a forceps operation is sufficient to permit spontaneous delivery. Similar enlargement is usually accomplished by the Sims' position. In about two-thirds of all cases of funnel pelvis postural treatment results in normal delivery or establishes conditions permitting a satisfactory delivery with the use of forceps. In other instances, the hindrance to the passage of the fetal head is not so easily overcome and a more radical procedure must be employed to effect delivery.

To illustrate this point, two cases which have necessitated the application of this principle are presented.

A white primipara was registered in the prenatal clinic at the eighth lunar month of pregnancy. The preliminary mensuration revealed a superior strait of normal dimensions, but there was a notable shortening of the bituberal diameter of the inferior strait (Fig. 1). Upon referring to the diagram, which is drawn to scale, it is seen that the transverse diameter of the extremely long and narrow arch measures only 5.75 cm., and that the posterior sagittal diameter measures 8.5 cm., totalling 14.25 cm., while the minimal compensating length is theoretically 9.75 cm. Granting that circumstances such as an abnormally small or premature child, or marked molding of the head might modify one's conclusions in the matter, it was clear that the vaginal delivery of a normal sized fetus at term would be sufficiently doubtful and dangerous as to justify the consideration of alternative methods. Under such circumstances pubiotomy has been advocated, for this operation not only permits of the delivery of the child, but in many instances leads to a perma-

*Read at a Meeting of the New York Obstetrical Society, May 13, 1924.

nent enlargement of the inferior strait. On the other hand, the technical difficulty involved in the performance of pubiotomy may be considerable; there is danger of injuring the adjacent bladder and urethra, and moreover, since the healing of the bone wound occurs by fibrous union, interference with locomotion is possible. Accordingly, it appeared that delivery by conservative cesarean section offered the best immediate prospect for mother and child, as well as the most favorable prognosis for the subsequent maternal health and for anatomic as well as functional integrity. With these points in mind we employed a conservative section in this case with a satisfactory outcome for mother and child.

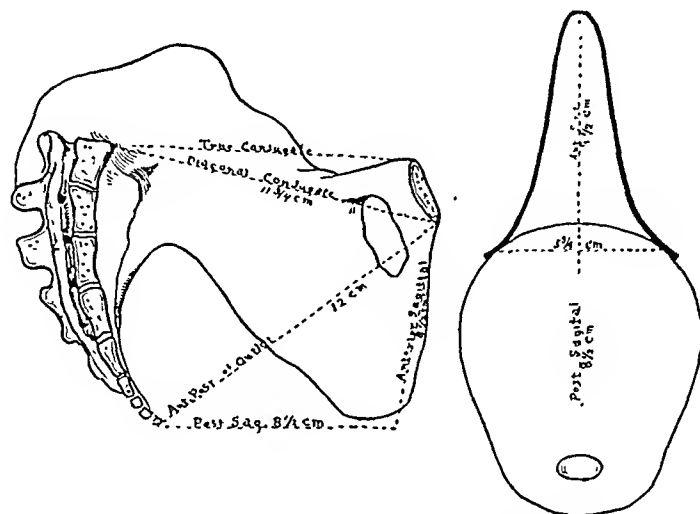


Fig. 1.—Diagrams of the pelvic outlet in Case 1, illustrating the necessity for delivery by cesarean section.

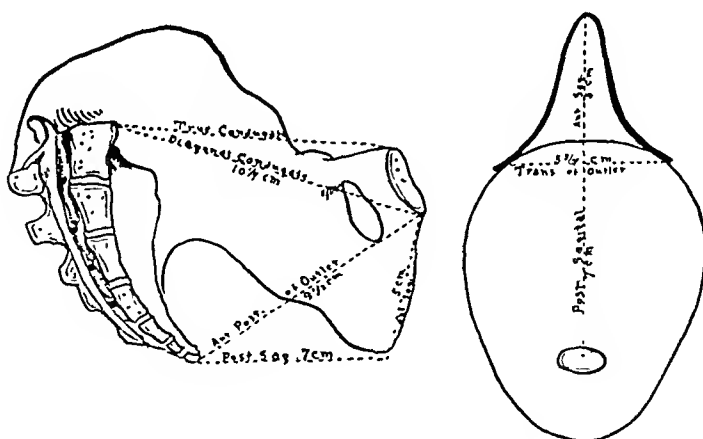


Fig. 2.—Diagrams of the pelvic outlet in Case 2, illustrating the necessity for delivery by cesarean section.

The second patient was a primiparous woman first seen at term. Because of the presence of an advanced osteomalacia, our immediate interest centered in the pelvis and its relation to the problem of the moment.

Most characteristic was the trefoil shaped superior strait with a diagonal conjugate of 10.25 cm. Such a diameter in itself might not prohibit normal delivery, but this pelvis presented a transverse inlet contraction also, thus reducing the available area to minimal limits. Turning then to the pelvic outlet, it was found that in contrast to rickets, with its flared arch and widely separated tuberosities, there was here an outlet contraction of extreme severity (Fig. 2). By re-

ferring to the diagram it is seen that a narrow pubic arch with a transverse diameter of 5.75 cm. forces the head so far posteriorly that the corresponding sagittal diameter assumes first importance. The latter measured only 7 cm., while the sum of the two measurements equaled but 12.75 cm., falling 2.75 cm. short of the minimal requirement of 15.5 cm. for spontaneous delivery. In this instance conservative cesarean section was performed, with wholly satisfactory results.

When one speaks of pelvic contractions the natural tendency is to think of deformities of the pelvic inlet or superior strait, for several reasons. (1) These deformities represent the most common types of pelvic contraction seen in practice. (2) Bony changes affecting the superior strait are characteristic of rickets, the most prominent etiological agent among all bone diseases. (3) Contractions of the pelvic inlet are more easily recognized, especially in late pregnancy, when maladaptation of the presenting part is obvious, even to such superficial examination as abdominal palpation. (4) The study of contractions of the pelvic inlet has been placed on a scientific and mathematical basis for a longer period of time, so that practitioners of the present generation are versed in such conditions; while the recognition, etiology and treatment of the abnormalities of the pelvic outlet is a relatively new field and the funnel type is the latest contribution to the accepted scheme of bony pelvic contractions.

However, since a contraction of the pelvic outlet, including all varieties, occurs in about 7 per cent of obstetrical patients, and since it is probably the most common form of bony pelvic pathology encountered among white women in this country, the pubic arch is always to be reckoned with, and should be measured routinely at the preliminary prenatal examination. Such a study is only complete when it includes the recognition of the general shape of the arch gained by digital palpation, confirmed by accurate mensuration of the bituberal diameter of the outlet. When the arch is wide and has a corresponding transverse diameter above 8 cm., further information is rarely necessary. On the contrary, if the arch is so narrowed that its bituberal diameter is 8 cm. or less, the length of the posterior sagittal diameter must be accurately determined. From a practical standpoint these are the two important diameters; and in a patient with a funnel pelvis the probability of a spontaneous delivery primarily depends not upon the absolute length of either diameter, but rather upon the relation which their measurements bear to each other.

(For discussion, see page 658.)

THE CAUTERY TREATMENT OF CHRONIC CERVICITIS, WITH HISTOLOGIC STUDIES

BY B. Z. CASHMAN, M.D., F.A.C.S., PITTSBURGH, PENNA.

BECAUSE of the anatomic structure of the cervix uteri, deep seated infection in the cervical glands is difficult to eradicate except by radical measures. The futility of treating chronic infection in the tonsil by surface applications of antiseptics or caustics has long been realized and it is time that we realize the ineffectiveness of local applications for the cure of chronic cervicitis. In spite of all forms of office treatments the great prevalence and persistence of leucorrhea, which is the most prominent sign of chronic cervicitis, bears out this point. It is because of the persistence of deep cervical infection, its great prevalence and the morbidity produced by it that we now believe that it deserves radical treatment in all except the superficial infections. By radical treatment we mean complete removal of all cervical glands by amputation or by a much simpler method, complete destruction of all cervical glands with the cautery.

TECHNIC

Hunner¹ first advocated making radial incisions with the Pacquelin cautery at the external os and after healing had occurred other radial incisions and so on until the cervicitis is apparently cured. Dickinson² advises similar treatment with nasal cautery. Our procedure is to dilate the cervical canal thoroughly, thus stretching out the depressions which give the glands a much deeper appearance than actually prevails. We then aim to cauterize at one sitting the entire cervical canal for the depth of about 1/8 inch with a Downes electrocautery knife. At the external os, we make six or eight radial incisions about 1/4 inch deep and extending well on to the vaginal portion of the cervix, thus destroying the cysts and deep glands. We again dilate the cervix after the cauterization. This is not an office treatment.

EFFECTS OF CAUTERIZATION

The question arises as to how deeply it is necessary to cauterize in order to actually destroy the infected glands, and to treat chronic cervicitis as a prophylactic measure in the prevention of cancer. In order to determine exactly what occurs as a result of this treatment with the cautery, we made the following observations:

CASE I.—Cervix was cauterized preliminary to supravaginal hysterectomy for fibroids. Six months later the patient was operated for bilateral inguinal herniae, the remaining cervix was removed and gross and microscopic examination showed



Fig. 1.—Chronic cervicitis. Before cauterization.

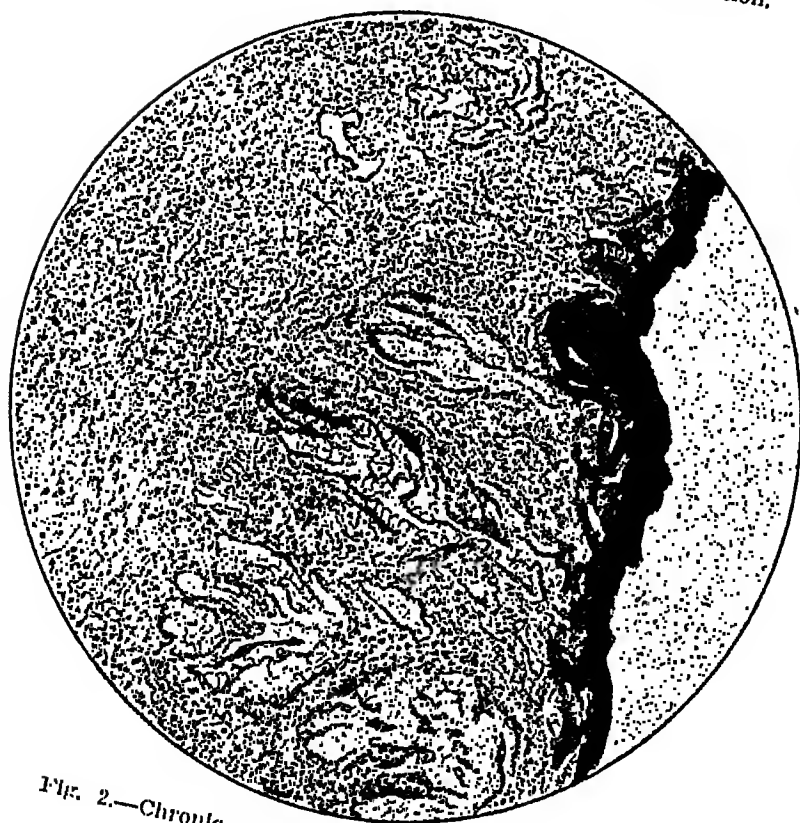


Fig. 2.—Chronic cervicitis. After cauterization.

complete stenosis of cervical canal and complete absence of cervical glands, showing that the procedure was efficient in destroying these structures.

CASE 2.—Chronic cervicitis. A section was removed for microscopic examination and the cervix then cauterized. This was followed immediately by amputation of the cervix for study of effects of the cautery. Fig. 1 shows the deeply infected glands before cauterization. Fig. 2 shows section of cervix immediately after cauterization. It is noted in Fig. 2 that the effect of the heat is evident at some distance from the charred area, the outline of the glands being preserved but the epithelium is destroyed. This procedure has been carried out in several cases with identical results.

CASE 3.—Cervix cauterized for chronic cervicitis, and the usual aftertreatment, consisting of weekly dilatations of the cervix carried out. One year later, patient was admitted to the hospital for tonsillectomy. The cervix was normal in appearance and cervical canal was patent. Menstrual periods were normal and there was no leucorrhea. While the patient was under anesthesia for tonsillectomy, the cervix was amputated. Sections through upper portions of cervical canal show it to be lined with columnar epithelium, and glands dip down a short distance into the stroma of the cervix. In lower portion of the cervical canal, squamous epithelium is found extending up from the vaginal portion of the cervix as is seen normally in the senile cervix.

The opportunity for re-operating these cases and studying the cervix microscopically has not been great and we submit this brief report in order to stimulate further study along this line. The question of what type of epithelium replaces the destroyed epithelium in the cervical canal and whether there is any regeneration of cervical glands, is important from a physiologic standpoint with reference to the possibility of future pregnancies. Case 3 showed definite short glands extending from the cervical canal after healing had taken place, suggesting regeneration of the glands, for our other observations make us feel sure that the glands were destroyed in the original procedure. The presence of squamous epithelium in the lower portion of the canal seems to indicate that in the epithelization of the granulating area in the healing process after cauterization, the columnar epithelium grows down from above and the squamous epithelium grows up from below. From our studies of the cervix after cauterization we feel that superficial cauterization with a nasal cautery is inadequate for the destruction of the cervical glands. It may seal in the deeper portions of the glands and cause cyst formation, and the deep infection, the lymphatic involvement and the possibility of cancer remain, although the leucorrhea will often be relieved.

AFTERTREATMENT

There are two important points in postoperative treatment. About a week or ten days after operation, there is at times a bloody flow which is not menstrual in origin. It is due to hemorrhage about the time of the separation of the slough. In five years' experience with this method, we have seen bleeding to the extent that we felt that active measures

were necessary to check it, in only four cases. Packing of the vagina readily controlled this. Usually when bleeding occurs, it is no more than is ordinarily seen at the menstrual period and no treatment is necessary. Severe hemorrhage is more frequent after amputation of the cervix than after cauterization of the cervix.

The other more important consideration is the prevention of stenosis of the cervical canal. Without proper aftertreatment of the cervix, stenosis will occur in a large percentage of cases. This occurs early, not from scar contractions, but from the growing together of two granulating surfaces. This occurs chiefly at the external os, and is manifested by cramps preceding the onset of the menstrual flow. In several cases in which there were severe cramps with no flow, we found complete stenosis at the external os. On inserting the dressing forceps through this, there was an escape of retained menstrual blood, and no stenosis found higher in the cervical canal. As a result of this experience, we now have these patients return four weeks after operation, at which time the slough has disappeared and there is a clean granulating wound, and under aseptic conditions, we pass a dressing forceps into the canal. They report for similar treatment every week for four or five times until epithelization of the canal is complete, and thereafter there is no trouble.

USES AND ADVANTAGES

Cauterization is applicable to all cases of cervicitis in which there is not too extensive laceration or deep seated cystic and fibrous changes in the cervix, in which cases amputation by the Sturmdorf method is preferable. It is the best and simplest method of treating chronic leucorrhea. The annoying persistence of leucorrhea even after removal of tubes, uterus or both, with the cervix left behind, has led us to cauterize the cervix in all operations for tubal infection. Chronic endometritis and metritis are practically always secondary in inflammation in the contiguous structures, the cervix and tubes, and it is only by eradication of both that we will get the best results. Complete excision of fallopian tubes combined with cauterization of cervix makes the necessity for hysterectomy much less frequent in pelvic inflammatory disease. It has been stated that cauterization of the cervix greatly diminishes the possibility of future pregnancy. Where it is necessary to remove the tubes, this is not a factor and we do it routinely regardless of the extent of the cervicitis, for the cervix is the original source of the tubal infection. In many cases of cervicitis, it is very evident on first examination that local antiseptic or caustic treatment is futile. In doubtful cases after a few weeks of local treatment it can usually be determined whether the condition will clear up by such local measures or whether surgical treatment is necessary. Excluding the acute and subacute and considering only the chronic gonorrheal infections, we feel that until we have some definite means of determining when the patient is cured,

the only sure method is by removal or destruction of the cervical glands. This is combined with cauterization of Skenes' glands and excision of Bartholins' glands when they are involved. Many cases of soreness in the lower quadrant of the abdomen with no history of definite attacks of salpingitis and with tenderness of the adnexa but no palpable enlargement or fixation, will be entirely relieved by this procedure.

We also cauterize preliminary to all supravaginal hysterectomies, for two purposes: (1) Immediate sterilization of the cervical canal, making a supravaginal amputation a safer procedure. (2) Destruction of cervical mucosa to prevent further leucorrhea, or cancer formation in the remaining stump. Panhysterectomy is a more extensive and serious procedure to the patient and with more chances of mishap and infection than supravaginal hysterectomy. Thorough cauterization of the cervix eliminates the necessity for panhysterectomy. In such cases, as deep cauterization as desired can be carried out, for with removal of the uterus postoperative stenosis of the cervix is of no importance and no postoperative dilatation of the cervix is necessary.

While education of the public may bring to us cancer of the cervix in its early stages, the only time when it is curable, it is doubtful whether we will ever handle the cancer problem until we begin to treat extensively the precancerous lesion, "chronic cervicitis." That cancer of the cervix is practically always superimposed on chronic cervicitis is generally admitted. Why should the cautery be reserved for cancer, when we can so readily cure the condition before there is cancer? Because of this, we frequently use the opportunity to cauterize the cervix for cervicitis in patients who come to us for other conditions requiring operation, such as, hernia, chronic appendicitis, cholecystitis, etc. The chief advantage of this method over the equally efficient method of Sturmdorf is its simplicity and the absence of bleeding at time of operation. With the cervix fixed by parametrial involvement in the chronic inflammatory process, the Sturmdorf procedure may be difficult and time-consuming and considerably prolongs the operation where removal of tubes and other intraabdominal work is to be done. The advantage of cauterization over radium treatment of the cervix is the more definite control of the action of the agent used and its limitation to the cervix.

Cauterization can be done under local anesthesia or at least under nitrous oxide analgesia. There is no after-pain and the patient is confined to the hospital for only a few days. Patients readily assent to this and as a rule prefer it to the prolonged periods of office treatment with uncertain results.

DISADVANTAGES

There is, of course, an increase in vaginal discharge during the sloughing stage. This varies greatly, and in many cases is not sufficiently great to attract the attention of the patient. Vaginal douches relieve

this condition. The possibility of hemorrhage is present, but as stated above has never been serious in our experience, and can readily be controlled, if necessary, by packing the vagina with gauze. The most annoying disadvantage is the necessity for postoperative dilatation of the cervix. This procedure is painful. Most patients stand it very well, but in the hypersensitive individuals a dilatation under nitrous oxide analgesia, such as is used by dentists for filling teeth, is preferable.

RESULTS

The conversion of a moderately lacerated cervix with large "erosion" and profuse mucopurulent discharge into a normal looking cervix resembling the nulliparous cervix, with no discharge, is really remarkable. Leucorrhea is eliminated in the great majority of cases. That there are certain cases of persistent leucorrhea when cervix and uterus have both been removed is well known. We have had a few cases apparently of this type, where the cervix looked normal and leucorrhea persisted. Cauterization of cervix is ineffective in the treatment of leucorrhea if infected tubes are not removed. With these exceptions and with the exception of those cases that are reinfected from their husbands, persistent leucorrhea means incomplete cauterization. But in a great majority of cases there has been complete cure of leucorrhea, sacral backache and dyspareunia. We have had a number of cases of pregnancy following cauterization, two of these after eight and ten years of apparent sterility, respectively. These cases were delivered without difficulty. By the appearance of the cervix, and the scar tissue chiefly in the region of the external os, we feel that there should be no more and probably less dystocia in these cases than in trachelorrhaphy or in amputation of the cervix.

CONCLUSIONS

1. Chronic cervicitis. Except in the superficial infections, it is curable only by eradication or destruction of the deep glands of the cervix.
2. Cauterization of the cervical canal with careful aftertreatment is the simplest and most effective procedure for its cure.
3. The cure of chronic cervicitis is the most potent prophylactic measure in the elimination of cancer of the cervix.

REFERENCES

- (1) *Hunner*: Jour. Am. Med. Assn., 1906, xlv, 191. (2) *Dickinson*: Trans. Am. Gyn. Soc., 1921, xlv, 334.

DOUBLE UTERUS

By C. VAN ZWALENBURG, M.D., THOMAS A. CARD, M.D., AND
W. A. JONES, M.D., RIVERSIDE, CALIFORNIA

COMplete, double uterus in the human is an interesting anomaly and sufficiently rare to be made a matter of record.

Mrs. C. McP., age 35, gravida 2, was admitted to the Riverside County Hospital, suffering with pain in the right lower quadrant of the abdomen, of several days' duration. Her past history was uneventful except for the usual children's diseases. Her menses became established when 17 years of age, every 21 days, of 5 days' duration. No clots or pain previous to the birth of her child. She was married at twenty-two, and denied venereal infection. Her first pregnancy was at the age of twenty-three and terminated spontaneously at term. Puerperium was uneventful. Menses reestablished twelve months later with a twenty-eight day cycle and moderate dysmenorrhea. Her second pregnancy occurred three years later. This pregnancy, in contrast to the previous one, was marked by severe pain in the lower right abdomen. There were extensive varicosities of the lower extremities and vagina. Nausea was excessive. Spontaneous abortion occurred at the fourth month. The puerperium was uneventful except for lochia which continued for three weeks. Six weeks later her menses reestablished alternating twenty-one and twenty-eight days' cycle. The periods were characterized by pain, clots and severe headaches. Between periods there was copious yellow leucorrhea and almost continuous backache. Her present illness began several days before entrance. A diagnosis of pelvic inflammatory disease had been made by her physician who had advised hospital care. Her last menstrual period was one week previous to admission and of seven days' duration.

The physical examination was negative except for tenderness in the lower abdomen, more marked on the right side. Vaginal examination showed moderate yellowish grey discharge at vulva. The perineum was moderately relaxed. Cervix large and apparently lacerated. Pelvic examination proved very painful and thorough examination could not be made. However, to the right of what was taken for the uterus, an oval-shaped mass could be felt, behind and lateral to the symphysis. This was diagnosed as a probable right tuboovarian abscess. The left adnexa were tender but no palpable masses were found. Rectal examination as above. A speculum examination was omitted. Temperature on admission, 9:30 A.M., 97.8° F., at 1:30 P.M., 100.4° F. On admission W.B.C. was 18 000, R.B.C. 4,490,000. Twenty-four hours later W.B.C. was 13,000. Urine examination was negative except for some increase in pus cells and a few granular casts. Microscopic examination of smear of vaginal discharge, reported after operation was performed, showed gram negative diplococci present. Diagnosis made was pelvic inflammatory disease, subacute.

A midline suprapubic incision was made, permitting good exposure of the pelvis. Inspection showed the presence of two complete uteri with cervixes loosely joined. Each body had one laterally situated tube and ovary. There was no evidence of a tube or ovary from the mesial horn of either body. The right tube and ovary were involved in a tuboovarian abscess which ruptured while being delivered, and about 20 c.c. of pus was evacuated. The left tube showed considerable congestion. The left ovary was apparently normal. A total hysterectomy, left salpingectomy and right salpingoophorectomy was done. The abdomen was closed with drainage.

The postoperative course was uneventful for ten days, after which the patient complained of abdominal pain and distention. Her temperature became elevated

and clinical evidence of ilcus delevoped. The abdomen was reopened and several coils of small intestines were founud adherent by plastic exudate. These were freed but a recurrence of the condition several days later caused her death.

The illustration (Fig. 1) shows the specimen to be made up of two distinct uteri only loosely joined together at the cervix. Each body is slightly anteflexed. The left fundus measures 5.5 cm. \times 4.5 cm. \times 3.5 cm. The ora are separated 3 cm. The left os shows old radial healed lacerations. The right os is open but shows no visible lacera-tions. The right fundus is decidedly smaller and more vestigial in character. One fallopian tube is given off from the lateral side of the fundus. The right tube and ovary are joined together in a tubo-ovarian abscess. The left tube is infected but no macroscopic pus is



Fig. 1.—Double uterus with right pyosalpinx and left salpingitis. A, left os; B, right os; C, left fallopian tube; D, right tuboovarian abscess.

present. The patency of each tube was tested by passing a probe through each lumen to the fundus.

The woman had two pregnancies, one normal, and the attending physician made no comment of any abnormal development of the other, which resulted in an abortion at four months. An interesting speculation might be indulged in as to which of these bodies carried the pregnancies. It seems reasonable to suppose that the first, normal pregnancy occurred in the left or larger uterine body, the cervix of which bears evidence of laceration. On the other hand, the second pregnancy, complicated by severe varicosities and severe pain and terminated by abortion at the fourth month, very probably was of the right uterus.

HYDATID MOLE WITH SPONTANEOUS RUPTURE OF THE UTERUS*

BY IRVING B. KRELLENSTEIN, M.D., NEW YORK, N. Y.

(*Junior Adjunct Gynecologist, Lebanon Hospital*)

IN reviewing the literature, I find that only four cases of spontaneous rupture of uterus from hydatid mole so far have been reported. These cases are as follows:

1. Seitz (1904) Handbook of Obstetrics: patient died.
2. Lord (1868) Edinburgh Medical Journal: patient died.
3. R. C. Harkness (1921 British Medical Journal): girl, twenty-seven, gave a history of continuous and profuse "flooding" beginning with menstrual period and lasting four weeks. Patient became anemic, and abdomen was rigid and distended. Because of the acute signs, abdomen was opened and peritoneal cavity was found full of blood. Perforation was discovered on the posterior wall of uterus. Hysterectomy was done. Patient recovered.
4. Waldo (1910) American Journal of Obstetrics: diagnosis in this case was ruptured ectopic. On opening the abdomen, uterus was found to be twice as large as uterus should be at the end of the third month. Hysterectomy was done. Patient recovered.

Spontaneous perforation of the uterus, due to hydatid mole, is a very rare condition. The following case presented by me, and operated upon by Dr. Seeligmann, makes it a fifth case in the literature.

Mrs. A. has two living children. Was pregnant November, 1921, was curetted by her family physician who removed a normal ovum with well-developed chorionic villi, the ovum being about six weeks old.

The patient admits having had intercourse shortly after. She was seen by a well-known gynecologist when her period did not return in December, who said that she was pregnant again and had small fibroids besides. The patient did not menstruate in January and also in February till the time of admission into the hospital. The morning before admission, patient woke up with a very violent sudden pain in the lower abdomen, in no particular spot, but as she described it, all the way across the abdomen. Also had spasmodic bladder pressure. Her family physician saw her in the morning and found her in collapse; visible mucous membranes, exceedingly pale, skin waxy, pulse very weak, at times hardly palpable, but remarkably slow. She arrived at the hospital at noon with a diagnosis of ruptured ectopic. On admission the temperature was 99.6, the pulse at times hardly palpable, but slow. Percussion apparently showed free fluid in the abdomen which, however, was not very much distended. The uterus was found to be thick, doughy and larger than it should have been according to the history of a two months' pregnancy. No swelling could be felt corresponding to either one of the fallopian tubes. Douglas seemed empty, so that the possibility of an intrauterine pregnancy with beginning abortion was discussed. Because of the extreme pallor, and the free fluid in the abdomen, it was decided to operate. Beginning at the time of the incision, the patient was given an intravenous infusion.

*Read at a meeting of the Bronx County Medical Society, May, 1924.

The abdomen was found full of blood. The intestines were covered with clots and fluid blood, the total of which must have amounted to one quart. After scooping most of this out, lying on the intestines was found a mass of hydatid mole. The uterus showed two perforations in the fundus between the origin of the fallopian tubes (Fig. 1). Out of these two openings came small hydatidiform bladders. Both fallopian tubes were absolutely normal, thin, pale and patent. It was evident that there was no ectopic, but that one had to deal with



Fig. 1.—Hydatid mole protruding through rents in uterine wall.



Fig. 2.—Cross section through uterus showing upper pole markedly thinned by hydatid mole.

a *mola hydatidiforme destruens*, which had perforated the uterine wall, the peritoneum and caused this tremendous hemorrhage. The palpating finger at the fundus felt the thinnest kind of a uterine wall around and between the two perforations. A subtotal hysterectomy was done, both uterine appendages being normal were left and stitched on to the stump. Patient made an uneventful recovery.

The specimen was examined by Dr. Milton Goodfriend at the Lebanon Hospital, whose report is as follows:

Specimen received in formalin. Consists of a uterus, the size of a three months' pregnancy. Surface of the uterus is smooth and regular. Consistency of the specimen has been changed due to formalin preservation. At the upper pole of the uterus is a small perforation through which are projecting a few grape-like masses. On section of the uterus, the wall at the upper pole is found to be markedly thin and has numerous grapes intimately attached to it. (Fig. 2.) The lumen of the uterus is filled with a large mass of this grape-like tissue. Microscopic section of the wall in the region of the rupture shows a marked thinning, only a few muscle fibers remaining. The muscle shows a moderate hyaline degeneration. There is an infiltration with round cells and an occlusional pus cell. No infiltration of the muscle by these grape-like masses. Section of the grape-like mass showed a collection of cysts of varying sizes filled with a clear fluid. The epithelial lining of these cysts is flattened in areas so as to be scarcely discernible.

The differential diagnosis of hydatid mole is not easy and cannot positively be made unless there is an escape of vesicles from the uterus. To the long list of diseases which have to be considered in making the differential diagnosis of ruptured ectopic, we must add rupture of uterus from hydatid mole. It may be extremely difficult to make a diagnosis. Hysterectomy is the operation of choice, for in these cases the wall of the uterus is so markedly thinned out, especially around the perforation, that to attempt to suture up this opening would be dangerous.

This case shows the importance of differentiating spontaneous perforation of a hydatid containing uterus from ruptured ectopic and that hysterectomy is the only feasible operation for such a case.

I desire to thank Dr. Seeligmann for permission to present this case.

1022 FAILE STREET.

INDEPENDENT FIBROMYOMATA OF THE BROAD LIGAMENT

By HOMER CARLTON SEAVER, M.D., F.A.C.S., LOS ANGELES, CALIF.

THE broad ligament is frequently the seat of pelvic neoplasms; fibromyomata, cysts, sarcomata and lipomata are found in this location. As would be expected, fibromyomata are the most frequent of the solid tumors. In practically all cases, however, these tumors occur as extensions from the uterus through the folds of the broad ligament. There can be found in the broad ligament a definite connecting link between the tumor and the uterus, and the latter structure is apt to present other growths. Occasionally, however, the tumor originates in the fibromuscular tissue of the broad ligament itself, and is in no way connected with the uterus; that is, it occurs as an independent fibromyoma of the broad ligament. It is this type of tumor which will be discussed in this paper.

The following case is reported because of the interesting phases of the differential diagnosis, the complications which followed the operation, and particularly because of the unusual type of tumor found.

Mrs. F. D., age forty-seven, married, housewife, was first seen on September 9, 1921; her complaint at that time being severe pain in the abdomen, fever, and failure to menstruate.

There was no family history of tuberculosis, malignancy or pelvic tumor of any character.

She had measles during childhood, and an occasional attack of tonsillitis, but no other diseases. She had had no operations. Menstruation commenced at the age of eighteen; was always regular, occurring every 28 days and lasting 4 days. During the first four or five years there was slight pain on the first day of the flow, but since then there has been no pain. There was no history of menorrhagia or metrorrhagia. She had never had leucorrhea. Her last menstrual period was on June 1, 1921, (that is, three months previous to the time she was first seen).

The patient has been married for 25 years. There was one pregnancy at twenty-three, which resulted in a spontaneous miscarriage at three months. There were no symptoms or signs of infection following this miscarriage.

For the past two years, at intervals of two or three days, the patient has had "severe attacks of gas on the stomach." These attacks usually lasted from three to four days, during which time she was constipated and occasionally nauseated, with two or three "vomiting spells." There had been no jaundice at any time and no abdominal pain. For the past three months, the patient has had urinary frequency, having to get out of bed three or four times every night; but there has been no pain or burning on urination.

The history of the present illness is as follows: On September 3, 1921, while on a holiday at the beach, the patient was seized with a severe, cramp-like pain in the right, lower, abdominal quadrant. The temperature was 100.2° F. and the leucocyte count 14,000.

The physician who examined her found no pelvic mass, made a diagnosis of pelvic peritonitis, and for the following six days the patient was kept in bed

and was given hot vaginal douches and sedatives. There had been one normal bowel movement every day. During this time the temperature remained at about the same level. Four days later there was a rise in the leucocyte count to 15,200,

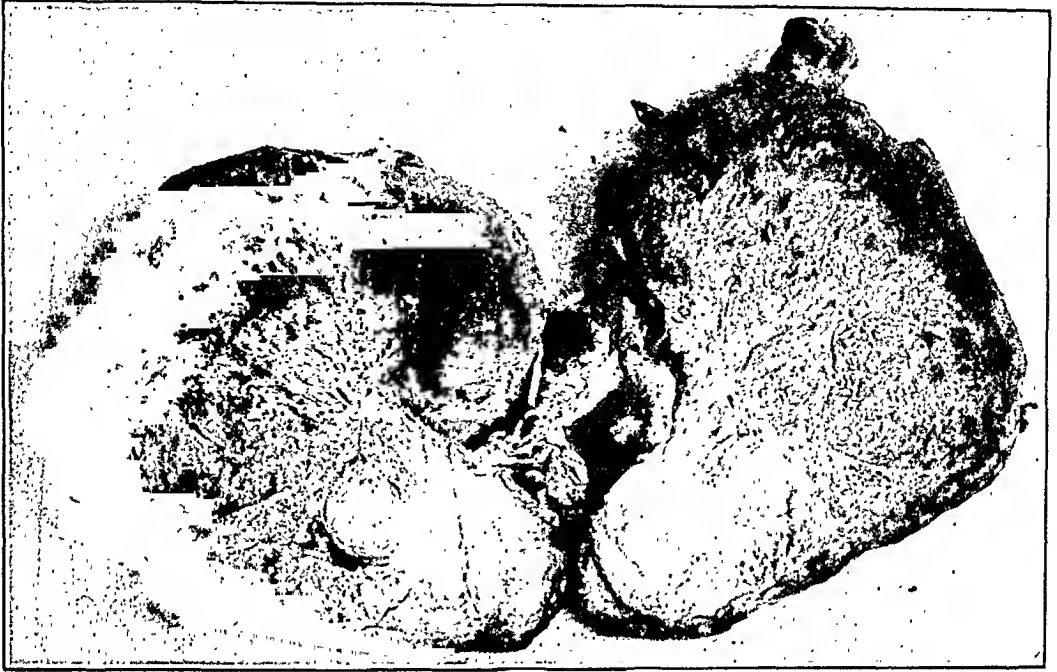


Fig. 1.—Cut surface of tumor showing fibrous and hemorrhagic areas.



Fig. 2.—Left surface of tumor, showing ragged areas to which were attached various viscera mentioned; small projection at left is contracted vessels contained in pedicle.

with 70 per cent polymorphonuclear cells. The pain in the right side continued almost constantly, occasionally extending to the left lower abdominal quadrant. There had been no nausea or vomiting. The patient and her husband were both

worried because of the fact that she had not menstruated for three months. There were no other symptoms of a beginning menopause. There had been no vaginal bleeding.

When first seen by the writer, the patient was lying in bed, conscious, but apparently suffering a great deal of pain. The temperature was 102° F. The pulse was 98, of good quality, and regular. The general examination was not important.

Abdominal Examination.—There was slight rigidity over the entire abdomen, more marked throughout the lower right and central portion. There was no tenderness in the upper abdomen, very slight tenderness in the left lower quadrant, and very marked tenderness on superficial palpation over the entire right lower quadrant, where there could be felt a large, irregular, firm, fixed mass which extended upward from the pelvis to the level of the umbilicus. The percussion note over this mass was flat, but throughout the remaining portion of the abdomen it was resonant.

Pelvic Examination.—Outlet: small, no cystocele. Perineum: firm. Urethral orifice: normal in appearance. Cervix: firm, not lacerated or eroded, points anteriorly, freely movable, not tender, and presents no discharge. Uterus was of normal size, normal contour and consistency; pushed to the left side and fixed in midposition; tender on attempted movement. There was nothing abnormal felt in the left fornix. Filling out the right fornix, and extending over into the culdesac could be felt a very firm mass of fibroid consistency which was very tender and fixed and seemed to be a part of the abdominal mass described above. There was one small area of fluctuation over the portion of the mass in the culdesac, but this was not more tender than other parts of the tumor.

In four hours the leucocyte count rose from 15,200 to 17,400, with an increase of polymorphonuclear cells from 75 to 85 per cent. The urinalysis was normal except for a very slight trace of albumin. Blood pressure: 130/76.

The patient was taken to the hospital, prepared for operation and anesthetized with ether. An exploratory vaginal puncture was first made over the fluctuating portion of the pelvic mass and about 10 to 15 c.c. of serosanguineous fluid was removed. The patient was then put in the Trendelenburg position and the abdomen opened by a midline incision.

Abdominal Findings.—Occupying the right lower abdomen and pelvis was the large, firm hemorrhagic mass to be described below. Two loops of small intestine, the sigmoid, both tubes, ovaries and broad ligaments, the posterior surface of the uterus, parietal peritoneum, the appendix, and cecum were densely adherent to the mass. The base of the appendix and the adjoining cecum were indurated and very friable; the appendix being deeply injected throughout.

The tumor was attached to the posterior surface of the broad ligament, close to the right tube and ovary, about two inches from the uterus, by means of a small, friable pedicle which contained large, twisted, blood vessels.

There were no other tumors in, or connected with, the uterus, tubes, ovaries or broad ligaments.

The mass was, with some difficulty, separated (by blunt finger-dissection) from the surrounding tissues to which it was attached, and delivered into the incision. This procedure left a number of raw areas on the intestines to which portions of the sac were attached. Instead of attempting to make a clean dissection at these points and expose the serosa, thus leaving new bleeding surfaces, these areas were left undisturbed.

The pedicle was ligated with No. 2 chromic catgut and the tumor mass excised. It was impossible to invaginate the appendix in the usual manner on account of the friability of its base and the adjoining cecum, so, after the excision,

its stump was thoroughly cauterized with carbolic acid and alcohol, and left in place.

The abdomen was closed in layers, in the usual manner; using a continuous No. 2 plain catgut for the peritoneum and interrupted for the muscle; No. 2 chromic catgut interrupted figure of eight sutures for the fascia; silkworm tension, and continuous mattress sutures of dermol to the skin.

Description of Specimen.—The specimen consists of a slightly flattened, firm, spherical mass, measuring 11×8 cm. The surface is dark red. The serosa strips off easily. Section shows at one end, firm, gray tissue, comprising only a small part of the whole tumor. The remainder is softer, dark red, hemorrhagic, but traversed by strands of fibrous tissue. In the gray tissue is a small, softened, myomatous appearing area. Sections from the firm portion show interlacing bundles of fibers. Van Gieson's stain shows no muscle fibers. In the red portion the fibers are largely necrotic and much blood is present.

Pathologic Diagnosis.—Fibroma.

Except for a marked nervousness and insomnia and the fact that there was somewhat more abdominal distension than usual, the first ten days of the patient's convalescence were very satisfactory. The tension sutures were removed on the tenth day and the wound found to have healed by first intention. Throughout this period there was a slight elevation of temperature each day, but never above 99.6 F.

On September 21st, or the eleventh postoperative day, the patient complained of severe pain in the left groin which extended down the inner side of the thigh to the back of the knee. This was followed by a rise in temperature to 100.2° remaining at practically this level for six days. With this rise in temperature, there was an increase in the leucocyte count from 14,000 to 18,500 with a corresponding increase in the polymorphonuclear cells from 75 per cent to 85 per cent. Examination showed the leg and thigh to be markedly swollen; with slight redness over a small area below Poupert's ligament, and in the popliteal space; and a definite tenderness not sharply localized, extending down the inner aspect of the thigh for about six inches. The leg and thigh were bandaged from the toes to the hip with cotton, elevated, and immobilized in pillow splints, the pain subsiding after three days.

On September 27th, or the seventeenth postoperative day, the patient complained of sudden pain and soreness in the right thigh. The temperature rose to 101.2 with a slight rise in the leucocyte count to 18,800, but with no increase in the polymorphonuclear cells. Examination showed the same findings as those given for the left leg, except that the swelling was not so marked. The same treatment was applied and the pain disappeared in three days. There was a gradual decline in temperature for four days and then it varied between 99 and 100.2 until October 12th, (the thirty-second postoperative day, or the twenty-first day after the development of signs of phlebitis), when it reached normal and remained so.

On September 30th, because of restlessness and sleeplessness, the patient was given 5 grs. of veronal, and this was repeated in 6 hours. Following it, the patient became drowsy and lethargic, and remained in a semi-comatose condition for two days; it being difficult at all times to arouse her. Reflexes were all normal; there was no neck rigidity or other signs of a beginning meningitis. On the third day her mental condition became normal again.

On account of her phlebitis the patient was kept in bed for three weeks after the temperature had become normal. Examination three months after operation showed an entire absence of swelling of the legs. Pelvic examination at this time showed the cervix to be anterior, freely movable, and not tender. Uterus; normal size, anterior, freely movable, and not tender. There were no masses or tenderness

in the fornices. The patient reported that she had no abdominal pain and only two or three attacks of "gas on the stomach" since leaving the hospital. Two years after operation, the patient reports that she is enjoying perfect health. There has been no pain or swelling in the legs, and no abdominal symptoms.

The principal conditions which had to be considered in making a diagnosis in this case were: (1) appendicitis with abscess formation; (2) ovarian cyst or fibroid tumor on a twisted pedicle; (3) pelvic inflammatory disease, and (4) extrauterine pregnancy.

The three months' period of amenorrhea, without other menopausal symptoms, and the presence of a unilateral pelvic mass necessitated the consideration of the latter condition. This was, however, the most unlikely diagnosis, because of the age of the patient; the lack of vaginal bleeding, the absence of softening of the cervix, the comparatively high temperature, the fact that the patient considered pregnancy impossible, and that this would not account for the gastric symptoms which had been present over such a long period of time.

An atypical appendicitis with abscess formation could account for the patient's symptoms, but the leucocyte count at the beginning of the attack was low, there was no nausea or vomiting and there was no history of a previous attack, and the mass was not as tender as a recently formed sac of pus should be. Tubal infection was improbable because there was no history of infection following abortion or labor; and there were no symptoms or signs of a gonorrheal infection. The entire picture seemed more apt to be due to an accident to an already present pelvic tumor of some sort. But this diagnosis could not be made positively, because of the assurance of the physician who examined the patient at the beginning of her attack, six days previous, that there was no pelvic mass present at that time. However, after an ether examination, the diagnosis of pelvic tumor was made.

It is questionable whether or not the mental symptoms following the ingestion of two ordinary doses of veronal could be attributable to poisoning due to that drug. However, since there were no signs pointing to organic trouble, and since the symptoms disappeared after two days, we must consider that there was an idiosyncrasy on the part of the patient towards veronal. Ordinarily we would expect the development of toxic symptoms only after the taking of large amounts of the drug, or in case of an idiosyncrasy, after taking the first dose. An interesting fact in this case is that during the previous month, at intervals of four to five days, the patient had taken an equal amount of veronal without injurious effects.

The question of postoperative thrombosis will not be discussed in detail. The presence of a hemorrhagic and fibroid tumor on a twisted pedicle, the inflamed and friable appendix, the separation of recent and dense adhesions, and menopausal age, are factors commonly given

as tending toward the production of thrombosis. Throughout the first ten postoperative days, there was a slight elevation of temperature which conforms to the findings of Wharton *et al* in their review of postoperative thrombosis.

Recently I have examined another woman who, I believe, had a solitary fibroma of the broad ligament. The patient was thirty years of age, had been married four years and had never been pregnant. There were no symptoms referable to her pelvis, except a slight cervical discharge. She was seen because her doctor found on a routine examination, a pelvic tumor. Examination showed a very small, anteverted and anteflexed, infantile type of uterus of normal consistency, and freely movable. The left adnexa were normal. In the right fornix, about two inches from the fundus, was a firm, fairly regular mass about the size of a lemon, which seemed to be in the folds of the broad ligament, and in no way connected with the uterus. The right ovary could be palpated independently of the mass. The patient left town and has not been heard from, but it seems, on account of the infantile uterus, the consistency of the mass, and its apparent independence of the uterus and the ovary, that it was probably an independent fibroma of the broad ligament.

Communications from a number of the large gynecological clinics of this country indicate the extreme rarity of this condition. One writer states that he finds several independent fibromyomata in his records, while another mentions one case. All of the others cite no cases but emphasize the unusual condition which was brought out by Lynch and Maxwell in their recent monograph on pelvic neoplasms.

Virehow mentions the development of these solitary growths from a pathologic standpoint. The first clinical case to be reported was that of Burnham in 1867. In 1895 Senn found eleven cases in the foreign and American literature. Up to 1907 there had been only twelve American cases reported. Vance reviewed these, and his own case was included in Doran's later compilation of thirty-two cases. Since then McNeile and Hamilton have described two cases, and there have been two or three other cases cited without detailed description.

Some observers claim that these tumors always have their origin in the uterus, that they gradually extend outward into the folds of the broad ligament until final separation takes place, the nutrition being then derived through the ovarian circulation. Their independent origin, however, is accepted by most authorities, because there exists in the broad ligament itself fibrous and muscular tissue which forms the basis of such tumors. The most frequent site is that part of the broad ligament nearest the uterus where muscular tissue is most abundant, and consequently these are more richly supplied with muscle fibers. When the tumor originates in this location, it is more apt to have a sessile base. Most of the foreign cases, and practically

all of the early American cases, including those of Boveé, Shaw, Goldspohn, Harpel, Vance, and a later one reported by Hamilton, were of this nature. Rarely they originate in the outer portion of the broad ligament where muscular tissue is sparse. G. E. Shoemaker reported a case of pedunculated fibrosarcoma which possibly originated in an independent fibromyoma of the broad ligament. McNeile's case was also pedunculated. So that, with the early cases (Mieuliez, Sanger, Bilfinger, Dolores, Tait, and Deletrez) there have been reported only about a dozen cases where the tumor was attached by means of a pedicle.

The age incidence is that of uterine myomata, that is, between thirty and fifty. They are practically always unilateral and contain as a rule much less muscle tissue than the corresponding growth in the uterus. Some of the early cases reported were quite large, weighing between ten and forty pounds. But the majority, especially those reported later, were much smaller. These tumors grow slowly, and consequently the symptoms which are usually due to pressure, develop gradually. They are subject to the same accidents that occur to similar tumors in the uterus, that is, infection, twisted pedicle, and the various types of degeneration. The prognosis after surgical removal is good.

The first case reported in detail above is the only one I have been able to find of a pure fibroma of the broad ligament, of independent origin, on a twisted pedicle resulting in a hemorrhagic necrosis.

REFERENCES

- Boveé*: Wash. Med. Annals, 1902, xviii, 479. *Doran*: Allbutt, Playfair, Eden. Syst. of Gynecology, 1906, 7. *Furniss*: Am. Jour. Obst., 1915, lxx, 143. *Goldspohn*: Am. Jour. Obst., 1902, 1, 241. *Hamilton*: Med. Jour. Australia, Sydney, 1917, i, 28. *Harpel*: Woman's Med. Jour., xii, 253. *Kelly-Cullen*: Myomata of the Uterus. *Lynch-Maxwell*: Pelvic Neoplasms. *McNeile*: Am. Jour. Obst., May, 1919. *Mummery*: Proc. Roy. Soc. Med. Lond., 1913-14. *Shoemaker*: Am. Jour. Obst., 1914, lxix, 1038. *Smith*: Tr. Royal Academy Med., Ireland, Dublin, 1915, xxxiii, 330. *Schriner*: Lancet Clinic, 1916, cxv, 487. *Vance*: Annals of Surg., 1906, xlv, 854. *Wilson*: Ill. Med. Jour., May, 1917.

1136 W. 6TH ST.

SPONTANEOUS VERSION

By PALMER FINDLEY, M.D., F.A.C.S., OMAHA, NEBR.

THE accompanying illustrations give evidence of a spontaneous version at full term.

In Fig. 1 is seen a breech presentation (L.S.P.), the occiput lying under the right costal arch. When I first examined the mother she



FIG. 1.—Breech presentation. Left sacro-anterior position.

was suffering severe pain in the region of the gall bladder. Her home doctors, three in number, could not come to an agreement on the diagnosis and the case was referred to me. A skiagraph was

made to settle the controversy and the patient remained in the Presbyterian Hospital of Omaha awaiting delivery. Two days after the first skiagraph was taken the patient recited in a most graphic manner how in the preceding night the baby became unusually active, so much so that she was thoroughly alarmed. Then followed a forcible tightening of the uterus. The active fetal movements persisted for

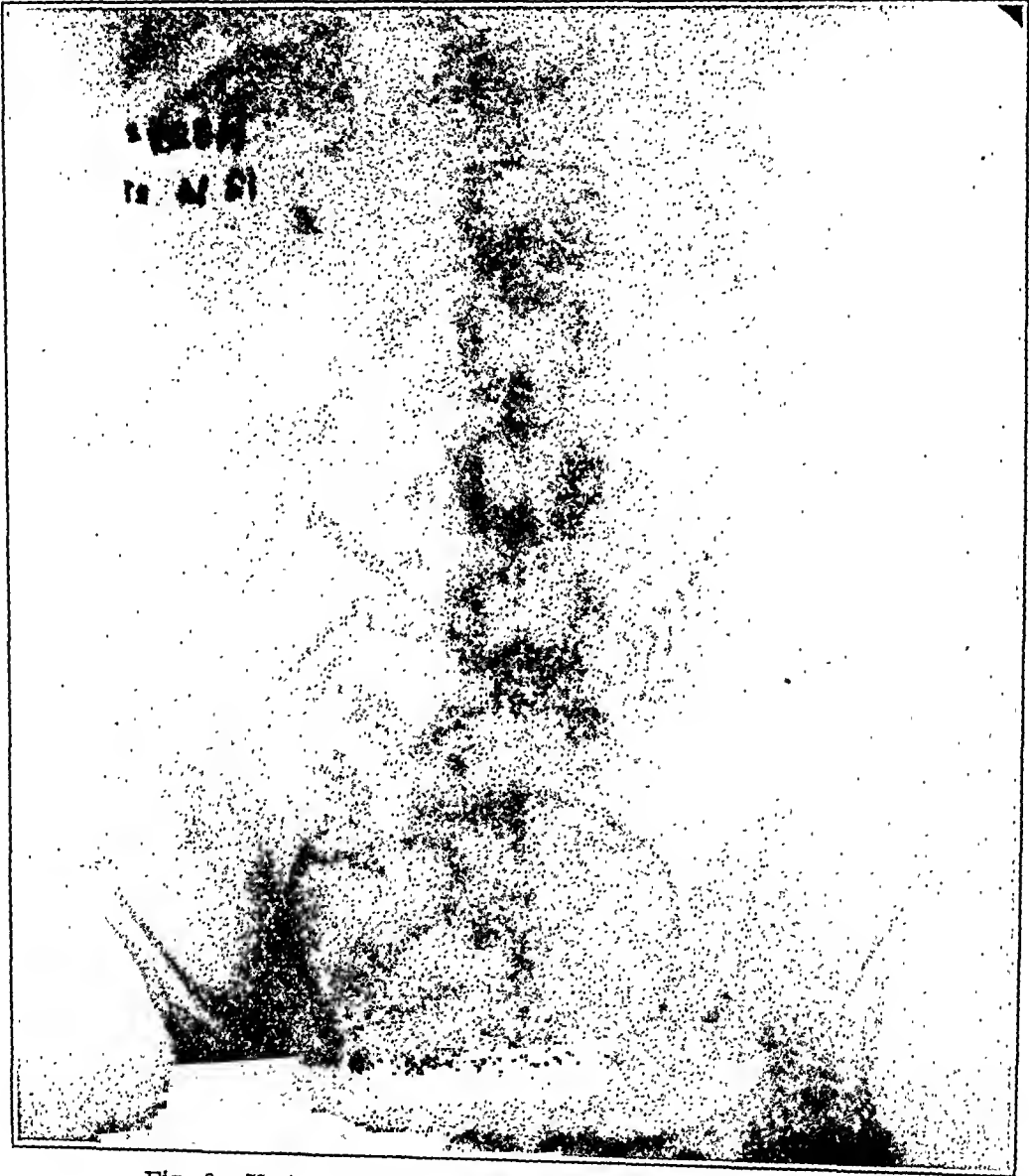


Fig. 2.—Vertex presentation. Left occipito-anterior position.

a minute or two and with the contraction of the uterus something slipped from under her ribs on the right side and she was instantly and permanently relieved from the pain which had persisted for several weeks.

On palpation I found the position of the baby as shown in Fig. 2. The head was at the brim of the pelvis. There had occurred a spontaneous change of poles from L.S.P. to L.O.P. The child weighed

seven and one-half pounds; there was no unusual amount of liquor amnii. The mother was a 5 para, aged forty. She was delivered twenty-four hours after the spontaneous version.

From the story told by the mother my inference is that the primary factors in the revolution of the child were the active fetal movements. It is probable that the baby effected the change of poles by pressing upon the right side of the uterus with its legs and as the body revolved from left to right the version was assisted by the contractions of the uterus, and gravity.

16TH AND HOWARD.

Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY

FORTY-NINTH ANNUAL MEETING

HOT SPRINGS, VA., MAY 15, 16 and 17, 1924

(Continued from October)

DR. GEORGE GELLHORN, St. Louis, Mo., read a paper on **Milk Injections in Gynecology and Obstetrics**. (For original article see page 535.)

DISCUSSION

DR. JOSEPH BRETTAUER, New York.—I have had considerable experience with the somewhat similar method of treating these cases with vaccines, and have yet to see a case which beyond doubt was benefited by their use.

The case described by Dr. Gellhorn impresses me as a rather unfortunate selection. To my mind, a bulging abscess in the pelvis, where the process has been entirely limited and localized, should always remain for surgical interference.

DR. FRED L. ADAIR, MINNEAPOLIS, MINN.—I have been using foreign protein in the shape of whole blood subcutaneously for a good many years. I was led to do this first, I think, in newborn infants and then I applied it in some cases of pelvic infection, and certainly some cases have recovered where one might have expected only death.

Dr. W. P. Larson at the University of Minnesota, was led to do some experimental work with foreign proteins on rabbits, which were injected with sheep's blood. Three of six rabbits developed antibodies. These six rabbits were subsequently injected with typhoid vaccine and the three which had developed antibodies showed no particular increase in the antibodies; two showed definite increase and one that had no reaction following administration of the sheep's cells had the strongest serum of any. As a result of that, he has propounded a theory that seems reasonable, namely, that certain human organisms, and animal organisms as well, when infected produce antibodies and while some of them release antibodies to combat the infection, others may produce antibodies but they are not released. The foreign protein when injected serves as a stimulus to the cells to release these antibodies and permit them to combat the infection. This brings up the point, then, of the selection of the foreign protein which should be used, and the idea is that the foreign protein should be used which always produces antibodies and which does not produce shock. This places the treatment with foreign proteins on a little more understandable and scientific basis and I think if we are going to use foreign proteins we should use them on some scientific basis. Treatments have been largely empirical and certainly some cases seem to have recovered with this treatment which might have died had they not received it. I believe the treatment with foreign proteins is of definite value in certain cases of infection, especially the type known as septicemia.

DR. R. M. RAWLS, NEW YORK.—At the Woman's Hospital up to the present time I have used milk in about forty patients, including cases of salpingitis with masses extending well up from the cul-de-sac into the abdomen. Of these forty cases we can report on thirty-three from two to eleven months. None were suitable for abdominal operation and all were given in addition rest in bed, hot or cold treatment. In none did the smears give a positive gonococcus. Some of the cases might have been subjected to a posterior colpotomy, but since using the milk injections we have not found this necessary. In one case aspirated through the vagina, blood only was withdrawn and an ectopic was suspected. An exploratory laparotomy revealed a pelvic mass pushing the uterus forward and both tubes subacutely inflamed. Many loops of small intestine and the sigmoid were bound to the mass. Colpotomy was then done and a posterior drainage of gauze inserted although only old blood was evacuated. After a stormy convalescence patient was finally discharged at the end of 45 days. The interesting point is that seven months later she returned to the hospital with a pelvic mass more extensive than before and our diagnosis was again pelvic abscess and we used milk. After ten injections the mass was reduced to 3 cm. in size and at the end of ten months, when the patient was last seen, she was entirely relieved of symptoms and the pelvis was entirely negative.

In another case treated for double pyosalpinx who received seven milk injections, an ovarian cyst persisted with symptoms and abdominal section was performed. We found the tubes apparently normal, with a few fine adhesions, and an ovarian cyst. The cystic ovary and appendix were removed and now, nine months after operation, patient is four months' pregnant.

In two cases there was a hard indurated mass intimately attached to the pelvic bone suggesting a periosteal tumor. Both cases absolutely cleared up with milk injections. In our 33 cases, which have been followed from two to eleven months, we had 17 cases with complete recovery, or 51.5 per cent. Of these, 16 were acute. We had improvement in 12 cases, seven had acute symptoms. There was no improvement in four and of these three were chronic, and one evidently a tubercular salpingitis with peritonitis, and finally patient had a bladder involvement and died of septicemia. These figures are significant as it is the acute cases for which milk acts best and the chronic cases if they do improve have exacerbations. In our series we got decided chills, lasting from five to 30 minutes in 19 per cent. Fever was high in 21 per cent and constitutional symptoms,—headache, nausea, general malaise, the usual rule. We had an increase in leucocytosis ranging from 1,000 to 19,000. The height of the leucocytosis occurs after four or five injections. Sometimes after first injections there is a diminution in the white cells but an increase with later injections. We have found that usually the full benefit is received in about six injections with an interval of three days.

DR. COLLIN FOULKROD, PHILADELPHIA.—From the standpoint of obstetrics, I think I can recall to the minds of some of you that this subject is not entirely new, but I think Dr. Gellhorn's method may open up a new method that will prove of value in many cases of undetermined origin early in the course of the infection.

Some French observer ten or fifteen years ago said that he noticed if he had a patient with septic infection and she developed a breast abscess, she would almost always get well. He pursued that fact so far that he advised the production of an artificial breast abscess in order that he might control the puerperal infection. Possibly his claim was that it was from the breast abscess or the milk, whether the infection was staphylococci or streptococci, and that the antibodies were produced faster than they could be put in by serum. I think many of us will disagree with Dr. Brettauer in that we have never seen acute infection

in the puerperium controlled in a very short time by serum. We may say that we do not feel that the specific serum action is anything that is developed by the germ planted in that serum, but rather perhaps by the serum itself. This method, perfectly harmless in itself, if that be true, might be used in any case where a septic infection was developing.

DR. JOSEPH B. DE LEE, CHICAGO.—There was one point in the Doctor's paper that I would like to develop a bit further. I have found that if a breast abscess burrowed through the breast, involving different segments every week or so and resisting cure, if I would let one of those abscesses come to a head almost and then open it and run the finger around very thoroughly, rubbing the pus into the tissue, that the woman would have a chill and then rapidly the breast would be cured. I practiced that several times with success. It was a rather risky procedure but the results surely justified it.

Another point is that injecting a foreign protein into the muscle is safe, but injecting the same protein into the blood would cause anaphylactic shock. Just two weeks ago I learned by experience that this rule, applied to another remedy which the manufacturers claim never produces shock, is not true. A patient had hemorrhage after labor, and had purpuric spots on her arms. She was flowing more profusely than she should six days after the baby was born, and we gave her what we considered a harmless injection of hemoplastin which we had been using for over four years. We had used it for both mothers and babies, injected intramuscularly into the thigh, without any harmful effects whatever. She was given about 4 c.c. and in about five minutes she was dead. It was the most rapid case of anaphylactic shock that has ever come to my notice. Death might have been due to the loosening of a clot in her pelvis because two days before she died she had complained of a stitch in her side, shortness of breath, and we suspected then there might have been a clot. After death the history came out that this woman had been subject to asthma, the attacks being brought on by the mere proximity of a horse. The serum is said not to contain any of the anaphylactic producing bodies, that they had all been removed; the manufacturers have reiterated that statement many times. I would doubt the advisability of recommending its use without the strictest reservations.

DR. W. B. VOGT, St. LOUIS.—Gynecology some years ago started in with being very conservative, because perhaps of the lack of knowledge of surgical skill, and then went over to the very radical operative treatment. And now again it is swinging over to the conservative, and I think that applies chiefly to conserving ovarian function in the young woman, and since these gonorrheal infections are mostly found in the young woman it behooves us to try anything that will conserve the generative function. I think, however, that conservatism can be carried much too far and I do not believe that Dr. Gellhorn himself would practice regularly the injections of milk in definite cases of pelvic abscess. I do not think that is a good surgical principle, and I believe all of us would rather incise a pelvic abscess. The milk injections which I have used after a good deal of thought did not impress me very much in the beginning as of great value, but I am seeing the value of this treatment more and more each day. In acute cases and the early subacute cases milk injections are of particular value. In the chronic cases, little or no result is obtained. In the infections about the cervix nothing can be accomplished as a rule, and this method must be combined with other methods of treatment, either local or general, as the indications may arise. I would be opposed to using the milk in such cases of pelvic infection where there was a definite pelvic abscess and I would rather be inclined to use the method we are all accustomed to, namely incising and draining.

DR. HERBERT M. LITTLE, MONTREAL, CANADA.—I have been using injections of milk for some time and think it is particularly valuable in acute cases. I know of at least one woman with definite salpingitis, pregnant after treatment with milk. I have also used turpentine within the abdominal cavity and found here, too, that there is the same immediate freedom from pain. The turpentine in paraffin was injected into the tubes, after the evacuation of their contents and the release of adhesions. In a number of cases where operation was inevitable, so-called "plaster of paris pelvis," the uterus was bisected and the appendages removed in the manner suggested by Dr. Kelly; and when drainage seemed indicated, I have used gauze wicks soaked in turpentine-paraffin. All these cases were characterized by absolute freedom from pain and smooth convalescence, the wicks were easy to remove and seemed to give better results than nonimpregnated gauze.

DR. G. GELLHORN (closing).—Dr. Brettauer very naturally questions the value of milk injections in culdesac abscesses where incision and drainage is so simple and satisfactory a procedure. I quite grant his argument and I am quite sure that there will be many cases where I, too, would incise and drain. This, however, is true, that after incision and drainage there always remain adhesions, scars, or other thickenings, whereas in the cases I report in my paper there was no vestige of previous inflammation noticeable. Do not think that I wish to recommend the milk injections as the one and only form of treatment in all inflammatory conditions. I feel as strongly as anyone in this room that the last word regarding the possibilities of protein therapy has not yet been spoken. In the meantime, let us go ahead hopefully, yet cautiously, and I should like very much to feel that after reading my paper you will admit that I have come forth with these claims only after a practical experience of almost three years and that at no time have I considered these injections a panacea or tried to do away with other satisfactory methods of treatment.

Dr. Anspach, who was to open the discussion, sent me a letter today in which Dr. R. W. Mohler, one of his associates, reports on the experiences at the Jefferson Hospital with milk injections. They treated twelve patients in all, seven of them with salpingitis, the rest more or less complicated cases. "All of these patients," says Anspach, "were given five or six injections of boiled milk, the largest dose being ten mls. There was a very marked improvement in the general condition of all; the pain became less, the weight increased, the appetite improved, and the anemia which was a marked feature in a few cases rapidly diminished."

None of the cases with marked anatomical lesions improved to such an extent that the lesions were not recognizable.

The conclusions we were able to draw from this small number of cases were, that milk injections relieve pelvic pain and tenderness, reduce the size of the pelvic mass, and improve the general condition of the patient. Most of them are more rapidly brought to a point where surgery may be undertaken with a minimum risk and there are a few patients who will need no further treatment.

DR. DEWITT B. CASLER, Baltimore, Md., read a paper entitled **Nephralgia with High Blood Pressure**. (For original article see page 569.)

DISCUSSION

DR. GUY L. HUNNER, BALTIMORE, MD.—I am sure we are all impressed from his description of this one individual case that it represents some form of nephritis, and with the end results of an interstitial nephritis, or a small, contracted kidney. The literature, as Dr. Casler has shown, mentions a good many different conditions

under the so-called nephralgic cases, among others those with hematuria. We know from Israel's work particularly that most cases of so-called essential hematuria have a background of nephritis, either localized or more or less general, and many of them have such evidences of a perirenal inflammation as thickening and contracture of the capsule.

My experience in kidney work convinces me that ureteral stricture is without doubt the greatest cause of nephralgia of any factor with which we have to deal. We find all types of kidney pain following stricture, from the dull backache to the most intense attacks of renal colic which we cannot differentiate at all from the attempted passage of an ureteral stone. The best evidence that ureteral stricture causes such attacks is that as soon as you open the stricture the attacks cease. It is the same way in the so-called essential hematuria cases: the best evidence that stricture is back of the kidney pathology which results in the hematuria is that the hematuria ceases after you give the kidney good drainage by ureteral dilatation. Even then some of these patients come back within six months or a year.

We have two gross types of kidney pathology following ureteral stricture: the type that develops a hydronephrosis, and the type which does not, and it is this latter type that represents the hypersensitive cases and they have the worst pain. They are the ones that give the most severe reactions after treatment; they are the ones that have the anuria symptoms; at times you have to wait twenty minutes or a half hour after passing the renal catheter before the kidney starts to function. The temporary anuria is often bilateral even after catheterizing only the one side. These are the cases that must often be treated for several years with ureteral dilatations. The strictures are more dense than in the hydronephrosis type. You can usually promise the patients with the hydronephrosis type that three or four treatments will suffice to make them comfortable.

The only criticism in my mind is, shall we call any of these cases essential nephralgia? Of course, nephralgia means nothing but kidney pain. The word essential or idiopathic is, when applied to anything, an admission of our ignorance of its cause. I think we must bear in mind the part that ureteral stricture plays in these cases. In the paper of Geraghty and Frontz they came to the conclusion that the diagnosis of idiopathic nephralgia "is arrived at by a process of elimination whereby the existence of all other possible factors, such as stone, hydronephrosis, ureteral stricture, infection, neoplasm, etc., can be ruled out with certainty." I think if we admit that idiopathic nephralgia is an entity we should be willing to abide by such a criterion. At the Brady Clinic the free passage of a plain catheter is regarded as evidence of the absence of stricture. By this method one overlooks at least two-thirds of all stricture cases. Again they fail to interpret slightly dilated ureters and pelves as an indication of distinct pathology. The normal ureteral lumen is filled by a No. 8 or 9 Fr. catheter and one should not demand that the lumen be the size of one's little finger before recognizing that it is dilated.

If we are to accept the above criterion as to what shall be classified as idiopathic nephralgia let us use rational methods for the exclusion of the one lesion, ureteral stricture, which, I am convinced by abundant clinical experience, is the most frequent cause of kidney pain.

DR. CURTIS F. BURNAM, BALTIMORE, MD.—There is one other cause of pain in the kidney which I think ought to be looked into, and that is pain due to vertebral arthritis. It is merely a suggestion, but we see a good many patients with apparently ovarian pain or apparently renal pain where the real source is vertebral. Of course, this has all been studied, as Dr. Casler has said, but I feel that it is important to have an orthopedic examination, and also particularly nose, throat

and mouth examinations for sources of infection in any case of pain in the kidney.

DR. CASLER (closing).—Dr. Hunner saw this patient. The ureters were very carefully looked after. At first it was impossible to get a good sized catheter up the left ureter but after that was thoroughly dilated there was no trouble. We had hoped the ureteral stricture was the cause of the pain, but her pain was just as great after the dilatation. We did the decapsulation as a last resort.

DR. ROBERT L. DICKINSON, New York, N. Y., presented a paper entitled **The Need of a Clinical Study of Contraception**. (For original article see page 583.)

DISCUSSION

DR. N. SPROAT HEANEY, CHICAGO.—I can only endorse the need of such a clinical study as has been outlined. We all have occasions when we wish to advise contraceptives and it will require statistics to furnish us with safe recommendations.

DR. E. P. DAVIS, PHILADELPHIA.—I believe there is no successful method for preventing conception and when people ask me I tell them that fact. I state that abstinence is successful, but as it is unnatural it may lead to unhappiness. Then they ask what can be done. The cases divide themselves into two classes; first, the intelligent, educated persons of high moral principles. An example of that is a wife and husband, the husband a Professor in a University, the wife a former teacher, his second wife. There are children by the first wife and by the second wife. He has no hope of increase in salary, there are no reserve funds available, they have all the children they can educate and care for. The woman told me she had talked to her woman friends and what she had heard was disgusting and more or less indecent, and asked if I would sterilize her. I said, "With the consent of your husband and yourself I will do so." That illustrates the educated persons of the community who are at the present time in a very bad financial condition owing to small salaries paid by institutions and the increased cost of living.

The second group is much larger, the hospital cases where the man, even with the prosperity of the wage earner, may have reached the time of life or his physical condition may be such that he can earn no larger pay. The woman has been more or less damaged by childbirth and they are going to criminal abortionists. There the Social Service is called in to make a financial investigation of the family. The physical condition of the woman is next gone over and the question determined whether general anesthesia should be used or local by infiltration or nerve blocking. If the woman be pregnant she is told that she will be carried on, if she is in good physical condition, to the termination of that pregnancy but after that she will be sterilized by removal of the fallopian tubes and appendix as well.

In my experience sterilization has been in selected cases successful in moral and physical effects, in all that could be desired, and in that I have faith, which I have not in any of the methods I have heard of up to the present time. I have, however, great faith in Dr. Dickinson and the medical profession must meet the question fairly. We must take the matter into our hands and find whatever truth there may be in it, but it is a very broad question, an economic question, and in some respects a religious and racial question.

DR. CURTIS F. BURNAM, BALTIMORE, Md.—What is the legal status of a doctor who does a sterilizing operation for economic reasons, not for medical reasons? Suppose such patients afterward decided that they had made a mistake in having

such an operation done and sought redress in the courts? Can I have any information as to what the courts might decide under such circumstances?

DR. E. P. DAVIS.—I am informed by legal advice that the law governing such procedures requires, and it is our custom in the Jefferson Maternity Hospital, that the woman sign her written permission authorizing the surgeon to perform any obstetrical operation necessary for the life of her and her child; obtaining this on her admission we need not delay. When it comes to these special cases I am informed that the written request of husband and wife would hold.

DR. FRED L. ADAIR, MINNEAPOLIS, MINN.—In cases where it seems necessary to perform sterilization, does Dr. Dickinson prefer a major operation for salpingectomy or a vasectomy, which is relatively simple?

I have never found a husband who would submit to this; he prefers to have his wife submit to the major operation.

DR. HAROLD C. BAILEY, NEW YORK CITY.—I believe that Dr. Dickinson's paper is very timely. However, it seems to me that we should decide clearly before we consider this resolution, whether or not we have a right to interfere from a social or economic standpoint. In New York State among American born children the death rate equals the birth rate, and among the foreign born the death rate is just a little over one-half of the birth rate, and it strikes me that the type of people who are going to make use of this contraceptive information for social and economic reasons belong to the educated and higher class of society. I think we should definitely decide that we ought to consider this subject from the medical and physical aspect and not from the social and economic standpoint.

DR. C. H. DAVIS, MILWAUKEE, WIS.—During the past year I have checked up on each patient who has come to me in a pregnant condition and found that 10 per cent of a highly intelligent class of woman had become pregnant while using a contraceptive which they had believed for some years was keeping them from becoming pregnant. I think it is undoubtedly the case all over the country that these women who have had three children say, or four, do not voluntarily become pregnant. So far as we know at the present time there is no 100 per cent safe contraceptive unless one or the other of the parties is either sterile or potentially sterile. The sheath, I believe, if it does not leak, is undoubtedly the safest protection but I find that the husbands do not test the sheath before and after, and unless this is done there is no certainty. If they are instructed to test the sheath before and after, and then have the douche used in case of a small leak, the sheath is, I believe, the nearest perfect protection we have today, but there is certainly much need for study of the subject.

DR. DICKINSON (closing).—Most of the women who need sterilization are bad surgical risks, therefore I have tried to find some method that would work safely and simply. The use of the nasal electric wire electrode passed up to the cornua was the result of many years of using the cautery for obliterating cervix cysts and the like. My series of cases dates back to the time before we routinely did insufflation of the tubes. Since that time I have only had two patients on whom I felt justified in trying to close the tubes.

Like Dr. Adair, all the husbands I know of have refused operation, and when you come to that it is not quite fair to put it up to the man. Perhaps he has a tuberculous wife. He may marry again after her death; it is not fair to make him sterile.

I hope you gentleman will believe that this is not propaganda; this is a serious scientific attempt to get at the facts.

NEW YORK OBSTETRICAL SOCIETY

MEETING OF MAY 13, 1924

THE PRESIDENT, DR. FRANKLIN A. DORMAN, IN THE CHAIR

DR. H. J. W. MORGENTHAUER presented, by invitation, a special
Enclosed Bed for the Care of Premature Infants. (See page 622.)

DR. HENRY C. COWLES (by invitation) presented a paper entitled
The Occiput Posterior. (For original article see page 616.)

DISCUSSION

DR. PAUL T. HARPER, ALBANY, N. Y.—The most striking feature of Dr. Cowles' paper is the familiar attestation as to the frequency of posterior position of the occiput.

Our textbooks tell us that the occiput is usually found at the front; but there is little attention given to furnishing a logical basis upon which designations between primary and secondary anterior positions may be made. The statistics presented in Dr. Cragin's book, for instance, were compiled in some measure by members of the resident staff among a majority of whom, it is my personal belief, the essential tests of primary position were presence of fetal heart sounds to the left or to the right of the umbilicus and, again, direction in which external rotation took place. If the fetal heart was heard in the lower left quadrant, position was L. O. A. If the occiput rotated to the right after delivery, position was R. O. A. As far as many were concerned there was little attention paid to the question of whether external rotation took place through an arc of 135° or of only 45° . Statistics into which even a reasonably large number of superficial observations enter fall short of conviction as to the actual frequency of primarily posterior position of the occiput.

I am convinced a great many primary occiput posteriors are missed because the general principles upon which the diagnosis was made, namely presence of the fetal heart to the right or to the left of the umbilicus in front and notation of direction rather than extent of external rotation, are still quite generally applied.

Further, I am convinced that the primary position is posterior more than half the time. The most valid proof of this, to my mind, is offered by noting direction and extent of external rotation. If after delivery the head turns through an arc of 135° , evidence that the primary position was posterior is quite conclusive, unless one can prove that some very marked abnormality of shoulder mechanism explains the extent of rotation.

In all posterior positions there is an element of deflection which, in the R. O. P., invariably brings the fetal chest and therefore the fetal heart sounds toward the front and to the left of the umbilicus, and invites error in diagnosis.

Our students are taught that, before delivery, the most dependable sign of primary posterior position is referable to location of the fetal small parts. Feet and buttocks are at opposite ends of the front-to-back diameter through the podalic extremity of the fetal ovoid. If the small parts, the feet particularly, can be seen and palpated to the left and the front, it is apparent that the buttocks are to the right and the rear and, since the occiput is in line with the buttocks, that the primary position is occiput-posterior. If this is checked up by the observation that the head turns backward at delivery through an arc of 135° , positive diagnosis of primary posterior position of the occiput is made.

As a matter of fact it seems quite reasonable to presume that primary position should be posterior. Ballotement is a physiologic phenomenon we are all familiar with and it proves that the child is heavier than the fluid in which it is immersed. The mother spends at least five or six hours out of twenty-four in one position, namely lying on her right or left side. The pregnant patient rarely sleeps on her back. The inevitable thing for the child's back to do is to gravitate into a flank and, remaining there for fairly extended periods, it is not unnatural for the head to engage commonly occiput-to-the-rear. It is evident that maternal posture is a factor in assumption of primary posterior positions.

As to operative procedures, I believe there is a fallacy attendant upon conduct of the Scanzoni maneuver and one associated with practice of manual rotation of the occiput.

Dr. Cragin stressed the fact that, in practice of the Scanzoni maneuver, forceps-traction favored deflexion since forceps tips rested and therefore exerted tractive force toward front of the head. Deflexion is relative in every posterior position and, with practice of this procedure, it would seem that undesirable increase in deflexion was quite inevitable.

The fallacy of manual rotation rests in supposing that a head in persistent occiput-posterior position because of disproportion could be rotated anteriorly by a maneuver that increased working diameters of the particular head to the extent of the thickness of the fingers that grasped it.

Single-blade instrumental rotation is in my opinion the simplest and most successful method of artificial rotation. It brings about uneventful delivery in about nine out of ten cases. It is so simple that in our hospital, median forceps operations are done without bringing the patients even to the end of the table. The instrument is introduced with the operator standing at the patient's side and, using a single blade to rotate and to hold the occiput anteriorly while the second blade is being applied, advance is readily accomplished. The tip of the forceps blade is placed beneath the occiput, the latter is then raised bodily and rotated anteriorly. You supply an artificial pelvic floor and convert an R. O. P. into an R. O. A. or an L. O. P. into an L. O. A.

In high arrest of the presenting part, particularly when associated with incomplete dilatation of the cervix, it is a matter of personal experience that in efficiency, lack of trauma to maternal soft parts and freedom from fetal injury, internal podalic version and breech extraction are far superior to high forceps and not infrequently to high-medium forceps application.

DR. A. B. DAVIS.—I agree with Dr. Harper that there are many more cases of occiput posterior than are recorded in our histories.

There is one point Dr. Cowles brought up and that is the change in the character of our patients. I do not think it is a negligible quantity. We are certainly seeing a change in the Lying-In Hospital. In 1912 I read a paper on cesarean section, and in this discussion, a physician made the statement that he delivered many thousand cases and had not found it necessary to have cesarean operations done and he thought if there were not so many wonderful abdominal surgeons we would not hear so much about cesarean section. I think he was honest. I believe he came from a community where the pelvis are of ample size. The thing we are apt to leave out of the question is the relation of the child to the pelvis, whether one is fitted to the other.

In the Lying-In Hospital we are seeing fewer of the rachitic type of pelvis, which you can tell beforehand that they require cesarean section. But there is a type that is not noted so much—you may call it the male type of pelvis, or the funnel pelvis. The women are of moderate height, very short in stature, with very wide hips, but made up largely of cushions of fat. These women give birth to children with thick bones and big, square, block-like heads. In those

eases we are quite apt to get the posterior position and the membranes are apt to rupture either before labor begins or soon thereafter. These patients do not go into labor rapidly; they have pains, but it may be a day or two before we wake up to the fact that they really are in labor, and soon after that the mother is tired out and we begin to get signs of distress.

Pelvimetry, I believe, has been overdone. In these patients the external measurements are usually up to or above the standard requirements and yet we have trouble. The proportions between the mother and the child are not suitable. If we recognize these cases earlier much can be done by manual rotation at the brim early in labor.

Then, if we had enough self-control and the condition of the baby did not require immediate delivery, we could let the patient come out and see that that rotation was maintained to the anterior. The trouble with many of these posterior cases, speaking of the midpelvis position, is that most of them do not come to the midpelvis in that position.

DR. G. L. BRODHEAD.—I am very much interested in Dr. Cowles' high percentage of persistent occiput posterior positions. Dr. Cowles' statistics have been made up of work done in the last few years during which time there has been a pronounced tendency to interfere earlier in the second stage than was the case some years ago, when the textbook statistics were compiled. The earlier in the second stage that we interfere, the more likely are we to find the occiput posterior and this fact would make a very decided difference in the percentage of persistent occiput-posterior cases at the present time.

Considering the treatment of persistent occiput posterior positions, it seems to me that with the head above the brim, or high up in the pelvis, the majority of us would naturally select podalic version. If the head is in midpelvis, we would choose between podalic version and the use of forceps. With the head low in the pelvis the Seanzoni maneuver of rotation with the forceps, if properly done, is practically devoid of danger to the mother or the child.

One point Dr. Cowles brought out in his paper was the extraction of the head with the occiput posterior. I would not bring the occiput out posteriorly in a primipara, if I could rotate the head easily with forceps. In the multipara it may make very little difference.

DR. COWLES (closing).—I believe our difference of opinion is rather based upon personal preference as to a method of operative termination. I think Dr. Brodhead is right in the statement that statistics compiled now will show a higher percentage of posterior positions than those previously gotten together, because I am not so sure but that the number of posteriors is on the increase.

As to the question of whether you should, or should not, rotate at the outlet, I thought I made it clear that this suggestion applies only where there existed a markedly contracted outlet. In such, the trauma produced by rotation would be more definite to the child and to the perineal floor, and for this reason an indication where I believe the posterior should come through as posterior.

DR. EMERSON L. STONE, New Haven, Conn., (by invitation) presented a paper entitled **Contractions of the Pelvic Outlet Necessitating Cesarean Section.** (For original article see page 625.)

DISCUSSION

DR. F. W. RICE.—The point brought out in regard to the importance of measuring the outlet and not waiting until the patient is in labor before finding out just what the condition is, is of value.

Where there is deformity of the spine, and a kyphotic pelvis, with narrow arch, we may get an extreme, often 10 centimeter posterior sagittal. I have seen two of these cases where prenatal observations certainly indicated an absolute obstruction. Both were in labor at home a long time and it was only after admission to the hospital, that it became apparent what a deep posterior sagittal was present.

DR. HERBERT THOMS.—In the textbooks the normal transverse diameter is given as 11 cm. by some authors, and by Williams as $10\frac{1}{2}$ cm. Those of us who have measured a good many outlets, have been impressed with the fact that even in normal cases the majority of the transverse diameters is less than this.

Some time ago with this in mind I studied 1,000 outlets of women who presented normal pelves and the average transverse diameter was 9.5 cm., which ought to establish the fact (unless a greater number of cases is studied) that the normal transverse measurement is probably near that figure.

DR. A. H. MORSE.—Dr. Stone has emphasized three points: the necessity of measuring accurately the diameters of the inferior strait in order to determine the character of the pelvic outlet; the importance of the length of the bituberal diameter in its relation to the length of the posterior sagittal, and the fact that not every patient with a contracted outlet will have a difficult delivery. With regard to the latter point, the statement sometimes made that patients in whom the bituberal diameter is 7 cm. or less must be delivered by cesarean section is not quite accurate, because the length of the posterior sagittal may compensate for the shortening of the transverse diameter.

We might have effected delivery in these patients following pubiotomy, as has been advised by Williams, but taking everything into consideration, delivery by cesarean section seemed the better method.

DR. H. HALSTEAD.—At Sloane we have taken into consideration not only the transverse and the posterior sagittal diameters, but in cesarean sections, have also noted a high symphysis, with a "poor inclination." This is a symphysis which, as the patient lies on her back, goes right straight up and down. We take that into consideration almost as much as we do the transverse and posterior sagittal diameters.

DR. JOSEPH BRETTAUER.—I have been simply struck by the frequency with which this condition was found in New Haven. The funnel pelvis was discussed over thirty years ago. I remember distinctly an authority expressing himself that it was a distinct skeletal racial difference; that it was found very frequently in certain Slavic races, that it was practically unknown among the Anglo-Saxons, in France and in England, and in Italy. So when I hear that it is present in 7 per cent of cases it is astonishing. There must be something about the public from which these cases are drawn to account for this. I mean that, to my mind, they must have some Slavic or possibly strictly Russian characteristics about them, not Jewish, for it happens very rarely in the Jews.

DR. H. C. WILLIAMSON.—Some years ago I wrote a paper on this subject and collected statistics right here in New York, in which the incidence was about 7 per cent.

DR. HERBERT THOMS.—For Dr. Brettauer's benefit, I would like to say that it may be of interest to note that Emmons, of Boston, went over 260 dry pelves of American Indian women at the Smithsonian Institute and there found the incidence of funnel pelves to be between 6 and 7 per cent.

DR. FRANKLIN A. DORMAN.—I should say that the frequency of the funnel pelvis is much greater than we have suspected, and if it comes down to the actual measurement of the bischiatric diameter we are going to find it is 7 per cent and oftentimes more. In my experience, I think I have met more of them in the Jewish than in the other races.

DR. STONE (closing).—In answer to Dr. Brettauer's criticism, I believe that in many instances the minor degrees of funnel pelvis pass unrecognized, but I feel that with a more careful study of the pelvic outlet we shall find the incidence somewhat higher than has been realized.

The difficulty in measuring the posterior sagittal diameter has been mentioned and without the aid of a special instrument this may be the case. In this connection I can recommend the Thoms' pelvimeter which we have used for the past four years with a great deal of satisfaction. It is made by the Wilms Instrument Company of Baltimore.

I wish finally to emphasize that in our experience the length of the normal transverse diameter averages somewhat under the textbook figures of 10.5 to 11 cm. I have found many more patients with a transverse diameter of the outlet falling between 9 and 10 cm.

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF MAY 2, 1924

DR. FRANK A. PEMBERTON presented a paper entitled *Acquired Atresia of the Vagina and Cervix*. (For original article see page 605.)

DISCUSSION

DR. GORDON GIBSON.—It certainly speaks well for that clinic where they can review their work for ten years and bring out such a large number of cases on this subject. I am sorry the essayist did not use the old term stenosis rather than partial atresia because so many of these cases are simply stenoses rather than atresias.

Certainly Dr. Pemberton's classification is a working one, and is one that perhaps we can all use. I like the idea of grouping them into premenopausal and postmenopausal conditions because the two are such entirely different things and their treatment is so entirely different, as the doctor emphasized.

I was in a way surprised that he classified so many of the premenopausal as postinflammatory. I think it is a pretty difficult thing to take a given case, where in the majority the history is, as he says, difficult to get—they are the poor, rather ignorant people—and say that this is due to inflammatory condition or to a pure congenital defect. Of course, it is true if you get a defect of the vagina you are apt to get a defect of the other parts of the genital tract, but it is possible to get a defect of the vagina without a defect of the uterus, tubes or ovaries or any of the genital tract.

I have not seen anywhere nearly the large number of cases that he has seen, but I have been largely inclined to believe that a good many of these things that we might think are due to infections are really congenital in origin.

The case of condylomata which he reported was very interesting to me because we had at the Long Island College Hospital recently a case of dyspareunia and an irritating vaginal discharge where the whole vagina was simply a mass of condylomata and also out on the vulva and for a considerable distance down the thighs. It was the worst looking thing I ever saw and the toughest proposition

to handle that we have come across for a long time. We obtained a very good result by the use of the actual cautery, at several sittings carefully and very superficially burning off these condylomata and keeping the vagina dilated so we would not get any constriction.

The other cases that we have seen have been, I think, more the result of faulty technic. I have in mind one case in particular of a patient who was operated on in a private sanitarium. This patient had had one baby and was torn and was sewed up. She went to three or four doctors and finally came into the hospital for dyspareunia; in fact, it was not a case of dyspareunia because there wasn't any intercourse because the whole vagina was a mass of scar tissue. I wrote to the doctor and asked him what he did and what the conditions were before and he said she had an extensive tear of the perineum, that he did a simple perineorrhaphy and that the patient went home well. That was the hardest case imaginable to handle. We operated on her three times before we got a vagina that would functionate. Whether she had an idiosyncrasy to vaginal operations or not I do not know, but, anyway, every time we operated on her it seemed as though we didn't get the results we hoped for and finally the only way we could do it was to split the vagina transversely and sew it up longitudinally and bring a flap of vagina down from the posterior vaginal wall, sew it to the introitus, and then used the glass plug that we don't see so much today. She wore that for a long time and we got a fairly good result finally.

Another thing which has fallen into disuse is the term adhesive vaginitis for the common everyday variety of senile vagina, which, as the doctor said, is simply an adhesion of the mucous membrane. The treatment of this condition is comparatively simple, but the term adhesive vaginitis really describes the condition better.

One of the most interesting cases that I ever saw along this line was a case of Dr. Grad's some years ago where a man did a curettage in the presence of an acute gonorrheal infection of the cervix, and in which he got an atresia of the cervix, as you would expect. I believe there are a good many of these cases of gonorrheal stenosis that are due to the fact that operations are done in the presence of infection, and I think we have seen quite a number of them recently where a certain operation is being done in the presence of an acute inflammatory process of the cervix. Certainly none of us have been able to achieve the plastic results of some of our predecessors where they took the patients, put them in the hospital, gave them douches and local treatments and relieved the local condition before any plastic surgery was done, and I believe the common cause of those disturbances, which the doctor so well described, is that we are doing operations at the present time in the presence of infection. I know our general surgical friends would not think of amputating a limb through an infected area and I do not see any reason why we should amputate or do any operation on the cervix through an infected area.

The treatment is not as easy as the doctor would lead one to believe. I believe we can sum it up in this way: The treatment means infinite patience; tell your patient it is going to take a long time, that you must in a case of atresia or stenosis of the cervix use careful dilatation and give the cervix a chance to grow a mucosa over that area. I believe there is nothing quite as good as weak solutions of silver nitrate in the treatment of these conditions. Strong solutions will cauterize but weak solutions stimulate the growth of the mucosa.

The last point that the doctor brought out was the treatment of atresias of the cervix. I think what he said is perfectly true, but I believe if any case has such a marked atresia of the cervix that that patient would be better off to have a hysterectomy and everything removed rather than try to play with a cervix which

has been so badly damaged. But stenosis of the cervix can be handled by careful dilatation and careful treatment in the office.

Certainly the number of cases that the doctor has brought out makes his paper authoritative and we must accept what he says.

In a way I am sorry he did not say more about the stenoses of the cervix which we are getting with radium. I believe they are becoming more and more common and believe until we learn more about the proper filtration and screening of radium we will get some rather difficult cases to take care of. Dr. Keene told me recently that all these atresias are not due to radium as they are to the way it is used, and that if it is properly screened and the alpha and beta rays are properly cut out, leaving only the gamma rays, we won't get these atresias.

I have had four cases of stenosis of the cervix recently. One of them was a real atresia and I know it was due to my own faulty technic because it was a case in which the radium was simply inserted into the cervix without rubber screen.

DR. GEORGE G. WARD.—I am particularly interested in this subject because the first paper I ever wrote, was on atresia of the vagina. I think that was in 1899. That paper was read before the Section of the Academy of Medicine in New York City—a case of atresia of the vagina, complicated by pregnancy. I was much concerned as to how she was going to deliver that baby with this diaphragm across the vagina, and I supposed we would have to do a cesarean section. However, in looking up the subject I found that in the majority of these cases the physiologic softening that takes place in the later months of pregnancy, which allows of such great dilatation of the vagina, also softens the atresia and allows of dilatation there, and in that particular case that is exactly what happened, and that was the reason why I wrote the paper.

I am interested in this subject from the point of view that Dr. Gibson just mentioned, namely, atresias resulting from radium. We are using radium quite extensively these days, and I have had the records in the Woman's Hospital looked up to see what cases we have had of atresia after its use. In some 700 cases in which we have used radium in the last few years, I found only 7 cases which had atresia, and in looking up those 7 cases we found 4 of them had the atresia independently of the radium; that is to say, they were cases of carcinoma of the cervix which had pyometra and obstruction before we used the radium. There were 3 cases which developed trouble subsequent to the application of the radium, but in one of these the cautery had been used in conjunction with the radium and how much the stenosis was due to the actual cautery and how much to the radium might be open to question.

My impression is very much as Dr. Gibson mentioned that we do not really need to fear atresia in these cases following the use of radium if it is properly used and properly screened. A good many have used radium without using the millimeter of brass or other metal, as well as the rubber, and perhaps it is due to the fact that we always use it in the Woman's Hospital Clinic that we may not have had so much trouble. We always have in mind the possibility of atresia following radiation in these cancer cases, and where we suspect it we pass a sound to see if the cavity is open. Only today it so happened that there was a case that had had radiation sometime ago and developed a temperature, and returned to the hospital and it was a question whether there might be a pyometra as the cause. I demonstrated that the canal was open and that there was no accumulation in the uterus.

As to atresia due to other causes, traumatism, for instance, Dr. Pemberton mentioned a case reported by Dr. Grad where strong nitric acid had been used in the vagina with the formation of dense scar tissue in the upper third, and I would like to speak of that case because of the very ingenious technic that Dr. Grad used in curing the condition and published in a recent number of the AMER-

ICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY. The atresia in this case was a nearly complete diaphragm across the upper third of the vagina. The method that Dr. Grad used consisted in cutting across the disc, catching hold of the cervix and pulling the cervix through the atresia and suturing the margins of the atresia to the cervix. The result was very satisfactory. Strangely enough only a week ago I had a similar case in my division in the Woman's Hospital and the technic I followed was identical to that used by Dr. Grad. My case was caused by rape when the patient was twelve years old. She is twenty years old now. There was a diaphragm across the upper third of the vagina with an extremely minute opening, through which one could pass a fine probe. At the time of the menstrual period the blood slowly dribbled through this opening, causing considerable discomfort and pain, and I was able to carry out the technic exactly as Dr. Grad described it.

A case of congenital atresia that comes to my mind, occurred about three years ago in a congenitally small vagina. The woman was in distress because her husband was going to leave her. Intercourse was not possible, and he was going to get a divorce. I succeeded in curing her by incising the vagina laterally and utilizing the labia minora on that side as an attached flap to fill in the gap, after unfolding it by dissection, thereby materially increasing the caliber of the vagina.

DR. EDWARD A. BULLARD.—This condition was very common in the old days. The various methods of treatment in those days frequently produced occlusions and atresias of the cervix, and even obliteration of the uterine cavity. At one time live steam was considered a very good thing to use in the interior of the uterus to stop stubborn hemorrhages or severe leucorrheas, and there are many, many cases in the literature where live steam had been used by the process called atmocausis, and the entire endometrium was destroyed and the uterine cavity obliterated, or the cervix occluded and a hematometra developed. Pure nitric acid was quite a favorite many years ago, and its application frequently resulted in total occlusion of the cervix, destruction of the endometrium and total obliteration of the uterine cavity. Pure carbolic acid accomplished the same result, as also did the actual cautery. A condition which we are seeing very infrequently today, but which was common in the literature of thirty to sixty years ago as a producer of complete occlusion of the cervix or obliteration of the uterine cavity, was puerperal sepsis.

DR. WILLIAM H. CARY.—I heard no statement in the paper in reference to chronic vulvitis as an etiologic factor. Two of the most obstinate cases I have had to treat were in virgins in the fifth decade where there was a chronic vulvitis without vaginitis, of an ulcerating healing type which occurs at the introitus and is associated with some pain. They are not cases of definite kraurosis either. They are very obstinate and very difficult cases to take care of.

DR. PEMBERTON.—We also treat vaginitis with silver nitrate and we are inclined to use a 10 per cent solution the first time, to get the surface epithelium off, and we then use a weak solution after that. One method that we use for condylomata is that of fulguration. You can fulgurate as many as the patient can stand at a sitting and gradually clear them up. As to the etiology of what I call the inflammatory atresias, it is difficult to determine whether they are inflammatory or congenital. I suppose you can only find that out by following cases of vulvovaginitis to see if they develop stenosis.

I agree with Dr. Gibson that partial atresia would much better be called stenosis.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

PELVIC VARICOSITIES—VARICOCELE PELVICA

BY JOHN OSBORN POLAK, M.D., F.A.C.S., AND
GEORGE W. PHELAN, M.D., C.M., BROOKLYN, N. Y.

TUBOOVARIAN varicocele was first described as a clinical entity by Richet in 1860—and many of the older writers have written on its etiology, pathology and symptoms—but the younger gynecologists, particularly on this side of the Atlantic, barely mention its existence.

A careful review of the literature shows that there have been no American contributions to the study of this lesion since the classical paper of A. Palmer Dudley in 1888, except the recent efforts of Emge published in *Surgery, Gynecology and Obstetrics*; Kelsall's paper in *American Journal of Surgery*, 1920; and that of Darnall, presented before the American Medical Association in 1917.

For many years the reviewers have been interested in the significance of pelvic varicosities as a cause of pelvic distress in women, since clinical observation on the operating table has demonstrated that many of the pains referable to the pelvis, found in the long ptotic type women and in multiparae with an enlarged uterus, associated with pelvic displacement of long standing, are not due to inflammatory conditions but to changes in the venous circulation of the pelvis.

Fortunately this condition, which must be admitted as a morbid entity, and which can be clearly defined from the anatomic point of view, may appear independent of any ovarian or tubal lesion. Yet it produces a symptomatology very similar to that of adnexal disease, and in time produces a definite pathology in the ovaries and pelvic tissues.

ETIOLOGY

The pelvic veins are specially predisposed to overdistension for the reason that they are without valves and are not supported by either muscle, fascia or integument and are under constant gravity pressure while the woman is in the erect position (Skene).

Richet, as early as 1860, stated that the uteroovarian plexus in little girls who had never menstruated was but slightly developed, but after menstruation was established or the woman had borne children, the size of the plexuses became markedly increased. That pregnancy tends to produce varicosities is borne out by the fact that phlebectasia occurs in 75 per cent of all pregnancies and may be found distributed in the legs, the anus, the extremities and vulva. This proves the marked effect of pregnancy on the woman's venous circulation.

When it is remembered that there are four plexuses of veins, namely the vaginal, the vesical, the uterine and the hemorrhoidal, which drain into the inferior hypogastric, the parovarian or the pampiniform plexus which in turn empty through the ovarian veins into the vena-cava on the right side, and into the renal vein on the left; and that there is only one valve to control the entire back flow on these vessels, and that this valve lies at the end of the right ovarian vein; one can readily appreciate the pressure to which these vessels are exposed with a woman in the erect posture.

The venous plexuses lying in the upper part of the broad ligament, the one above and the other below the hilus of the ovary making up the pampiniform plexus, are supported by nothing but loose cellular tissue, having very little padding to rest upon; and where this plexus empties into the ovarian vein, the supporting tissues are even of poorer quality. The ovarian vein with these plexuses may be compared to a hammock slung between the pelvic brim and the movable uterus, with but one fixed point at the outer end of the ovarian vein. Hence, one can readily see that any descent or displacement of the uterus which will lower the uterine end of the hammock, will increase the blood pressure within these upper pelvic veins. On the other hand, the veins at the base of the parametrium have strong support from a mass of dense connective tissue mixed with smooth muscle fibers making up the uteropelvic ligaments.

While it is generally conceded that the mechanical factors in the pelvis increase the blood pressure and result in varicosities, Cornil contends that there is primarily a chronic inflammation of the vascular wall which has several stages—first, a vascular dilatation with a marked cellular new growth of connective tissue combined with a cellular infiltration and disturbance of the elastic fibers. This subsides in the second stage and leaves the newly formed connective tissue, which shrinks and becomes fibrous and is poor in nuclei, while the regeneration of the elastic tissue goes on. A vessel so diseased cannot withstand even the normal pressure of the column of the blood and consequently sacculates with the patient in the upright position.

It can, therefore, be deduced that, notwithstanding the statement of DeValz "that one is born varicose," the condition is not congenital, but the result of the anatomic factors in the arrangement of the pelvic veins, due to the absence of valves, and the chronic inflammatory change in the vessel wall which leaves the vessel less resistant to the effect of repeated congestion and continued stasis resulting from menstruation, child-bearing and the continued upright position of the woman throughout life. Kelsall, like the writers, thinks that this condition is more common than is generally supposed, and attributes it to two causes: (a) general, and (b) local.

Under the first head, he mentions subinvolution of the uterus and of the ovarian vessels; too early and too much physical activity following labor, at which time there is a relaxed condition of the tissues and an unhealthy state of the vessel walls. This is probably occasioned by subinvolution or arrest of normal involution, and finally because the pelvic veins contain no valves.

Under local causes, he mentions habitual constipation and malposition of the uterus.

All observers agree that the left plexus is more frequently involved than the right, owing to the anatomic arrangement and the length

of the left ovarian vein and the fact that it drains behind the iliopelvic colon; and furthermore, that infections of the left parametrium, arising from injuries to the cervix, are more common than on the right side.

Skene, years ago, called attention to this condition and stated that it occurred more frequently in midlife. He had never seen a case of pelvic varicocele in a woman under 25 years or over 60. This fact suggests that menstruation and childbearing must be considered the principal etiologic factors.

Our own observations have shown that many of the thickenings and increased tensions which we find in the pelvis on the examining table, and which elicit exquisite sensitiveness on bimanual palpation in the fornices, entered in our records as "pelvic cellulitis," vanish after death or on the operating table. On inspection all the pathology that can be found is shown in the enlargement of the veins in the pampiniform plexus. When one realizes that during pregnancy all of the pelvic veins but more particularly those on the left side, owing to uterine torsion, become excessively enlarged and that the veins in the upper portions of the broad ligaments are unsupported and because of their lack of valves become blood sinuses, it is easy to conceive how immediately after delivery—due to the retraction and contraction of the uterus—this efferent venous circulation becomes suddenly obstructed and the vessels overdistended and permanently dilated.

This is more evident after twin pregnancy or hydramnios on account of the excessive elongation of the uterine vessels. Furthermore, any interference with proper involution of the uterus, descensus or displacement must disturb the circulatory equilibrium in the pelvis to a still greater extent and result in venous stasis because of the unsupported veins in the loose tissues of the broad ligament.

In parametritis or pelvic cellulitis, which is one of the most common forms of pelvic infection, Nature produces a protective exudate by inducing a venous hyperemia. This leads to a transudation of serum, a diapedesis of red cells, a migration of leucocytes and a proliferation of connective tissue cells within the peritoneal folds of the broad ligament; and as organization of the exudate takes place, the scar tissue contracts and interferes with the venous outflow. This in turn results in varicosities.

In opening the abdomen of patients with a history of previous parametrial inflammation, immense venous enlargement is a constant finding and explains the premenstrual pain that these women complain of.

Twin pregnancy or hydramnios with the consequent slow and imperfect involution and with relaxation of the uterine and pelvic tissues, leaves the pelvis sore from engorgement of the intraligamentous veins.

Dudley, in his admirable paper published over 35 years ago, sums up the etiology and pathology by dividing the causes: (1) into those that are constitutional; (2) and those that are mechanical.

Under the constitutional causes he mentions (a) arrest of involution of the uterine and ovarian vessels which keep up the pelvic engorgement long after delivery, acting in conjunction (b) with the relaxed condition of the pelvic tissues resulting from muscle and fascial injuries; together (c) with the low state of the general health;

and finally (d) an unhealthy condition of the vessel walls, due to inflammatory changes and the absence of valves in the pelvic veins, all of which allow an increase in the blood pressure from gravity, when the woman resumes the erect posture.

While among the mechanical factors which predispose to varicose formation, he calls attention to (a) the anatomic relation of the veins themselves; the left vein being more frequently involved, due to the fact that it empties into the left renal vein at a right angle; (b) the length of the ovarian vessels, which allows a greater column of blood to distend them; (c) habitual constipation with hemorrhoidal stasis; (d) and the effect of uterine displacement.

These mechanical causes are all aggravated, in the ptotic type woman or in the woman with a pendulous abdomen, by the change in the intraabdominal pressure which follows the abdominal distension of pregnancy, and increases the pelvic engorgement.

PATHOLOGY

The first clinical effect of this engorgement is to cause pressure on all of the pelvic tissues and nerves, giving rise to a dull, aching pain and pelvic tenesmus. Later this disarrangement of the pelvic circulation produces actual pathology in the uterus, parametrium, ovaries, rectum and bladder.

Microscopically, there is a striking increase in the vascularity of the ovaries and parametrial tissues. Congestion and edema of the ovaries are constantly observed. This leads, as time goes on, to an increase in the fibrous tissue of the stroma with cystic changes in the follicles, interfering with their function. The endometrium is also edematous and hyperplastic, and there is a hypertrophy of the mucous membranes of the uterus and portio, while the vaginal mucosa becomes turgid and is of a purplish hue. The uterus itself, necessarily participates in this engorgement with resulting tissue change.

With this understanding of the etiology and pathology, there is no difficulty in developing the symptomatology and physical signs.

SYMPTOMATOLOGY

The history is always significant. These patients either have been the subjects of repeated pregnancies, a twin pregnancy, a hydramnios, prolonged labor, or had an infection of the parametrial tissues following labor, and date their symptoms from this time.

They complain of pelvic fullness and dull, aching pain, most often referred down the left side, or radiating from the kidney, for two to three days before the onset of menstruation. Some menstrual disturbance and leucorrhea are nearly always present. All symptoms are relieved or disappear when the patient assumes the recumbent position, especially with the foot of the bed elevated, but are increased by walking or standing.

Gradually the premenstrual and menstrual aching prolongs itself into the intermenstrual periods until the gnawing pain is practically continuous except when the patient is lying down. The four main symptoms are:

- (1) Dysmenorrhea occurring as premenstrual pain of a dull aching character. This pain may be either unilateral or bilateral, but always grows worse on standing or walking, and just before menstruation,

but is relieved by lying down and with the appearance of the menstrual flow.

(2) Disturbances of menstruation owing to the endometrial hypertrophy resulting from the venous stasis. The menstruation is usually increased in quantity and prolonged in duration.

(3) Dyspareunia is often the symptom most complained of and this is probably due to the periphlebitis which involves the pelvic nerves, leaving them sensitive to motion and further pressure, from the increased congestion.

(4) A constant thin, watery vaginal discharge is frequently present. This results from the increased glandular changes of the endometrium. The pelvic pain may be increased after a movement of the bowels or after taking an enema, for a full rectum seems to support the varicosities and give the patient more comfort than when the colon and lower bowel are empty.

PHYSICAL SIGNS

There is a bluish hue to vagina and cervix, owing to the venous injection of the cervix and upper part of the vagina, which is frequently associated with varicosities of the vulva and thighs, when the patient is standing. On bimanual palpation the uterus and pelvic tissues are sensitive and there is an impression of tenderness in the fornices.

The uterus may be in normal position, low or retroverted, and is often somewhat enlarged, tender and sensitive to motion, with no apparent involvement of the adnexa.

Rectoabdominal examination of these patients in the erect posture, (after standing some minutes with the legs spread apart) will give positive evidence of varicose tumors in the broad ligament. On having the patient then assume the recumbent posture with the hips elevated, these tumors will disappear, only the vessel sensitiveness will remain.

PROGNOSIS

Varicose blood vessels in the pelvis, as in venous dilatations in other locations, are subject to the formation of thrombi, and owing to the deposition of calcium-salts in these clots eventually lead to the formation of phleboliths, which often are mistaken in x-ray pictures for ureteral stones. Also the large size of the vessels and the extreme thinning of the vessel wall may predispose to rupture. This is made more possible where there has been a history of inflammatory changes in the vessel. Then excessive muscular strain or trauma may become the exciting cause.

A sufficient number of authentic cases of rupture of a pelvic varix have been reported to justify us in thinking of it as a possible cause in the presence of an abdominal calamity in women, particularly after severe straining efforts. When the rupture is into the broad ligament a hematoma is formed, but it may so overdilate the ligament as to rerupture and form a hematocele with serious symptoms, and even cause death. Fleishman, Leclerc, Olliver, DePaul, Honig and Delbert have reported such cases.

The disease is always progressive unless recognized early and proper treatment instituted. Palliative measures immediately after confinement, such as the repair of injuries, correction of displacement, etc.,

will do much toward minimizing the effects of pelvic stasis and the associated venous dilatations.

TREATMENT

As the recognized causes of this condition are pregnancy, uterine displacements, multiparity, pelvic inflammation and colonic stasis, all of which tend to increase pelvic congestion in the normal woman, and which become exaggerated in the presence of ptosis or pendulosity, our therapeutic measures must be directed to the correction of these lesions by such methods as will tend to reduce the pelvic engorgement and reestablish an equilibrium in the pelvic circulation.

POSTURAL MEASURES

Presupposing that birth injuries have been properly repaired, involution of the uterus and of the pelvic tissues, including the veins, should be stimulated by routine postural measures during the period of uterine involution. This does not mean for the ten days or two weeks, during which time the patient is confined in bed, but for the ten to twelve weeks necessary to complete pelvic involution. These postural measures should be begun immediately following delivery and include the Fowler position, with an ice-bag over the fundus, to stimulate uterine contractions. Have the patient lie upon her abdomen for periods of two or three hours, twice a day, in order that the lochial discharge, which has been accumulated in the vagina, may escape. After the uterus is firmly contracted and the red lochia have diminished, abdominal exercises combined with deep breathing exercises, with the patient lying prone with a firm pillow under her back producing lordosis, should be encouraged and used for periods of half an hour twice a day. After the sixth day, prolonged periods in the knee-chest position will empty the pelvic vessels and aid in massaging the ligaments, besides tending to correct malpositions.

After the patient is allowed to leave bed, she should assume the knee-chest position for five or ten minutes on returning to bed, and night and morning practice the "Monkey-trot" or "Mule-kick" to empty her pelvic vessels, and reposit her displaced pelvic contents.

MEDICINALLY

Certain drugs are supposed to have an effect on the pelvic circulation. These include: ergot, hydrastis, thyroid and pituitary extract, all of which have their advocates.

Our personal experience has shown that in the early days of the puerperium the routine employment of ergot preparations stimulates the contraction and retraction of the uterus; that hydrastis seems to improve the general pelvic circulation, while in the later weeks small doses of thyroid combined with pituitary extract have a beneficial effect on the pelvic tissues.

MECHANICAL METHODS

The mechanical methods consist in the reposition and retention of the uterus in its normal plane of equilibrium, supported by a properly fitted pessary. Nothing in our hands has been so effectual as having postpartum patients wear a pessary until lactation atrophy is well established. This does not imply that every postpartum pa-

tient should wear a pessary, but it does mean that every puerperal case should have the uterus repositioned and secured by a pessary if malposition exists. Furthermore, in all cases of subinvolution a pessary relieves the pelvic drag, favors proper circulation and improves the involution.

Practice has shown us that, prior to employing mechanical means for retention of the pelvic contents in their proper plane, depletive measures relieve the pelvic congestion and make the condition more amenable to mechanical support. By these we mean aspiration of the uterus with Bier-cups, with the patient in the knee-chest position, and supplementing this with the vaginal tampon moistened with a boro-glyceride solution. One important technical detail should be mentioned, and that is, that the patient should be instructed to return to the office with the tampon in position and be placed in the knee-chest position for its removal.

By following this suggestion the great gain that is made in emptying the pelvic circulation is maintained, and the vessels, because of the elastic support and because of the hygroscopic action of the glycerine, do not refill and dilate before their tone has been improved.

SURGICAL MEASURES

Of the surgical measures that have been suggested for the cure of pelvic varicosities, but three need mention and comment. The simplest is uterine suspension by one of the methods that have been suggested to antevert and elevate the uterus. This, of course, excludes procedures which interfere with the venous circulation, such as the methods of Coffey, Webster, and the complicated procedures of Mann and his school. Probably the most effective form of suspension, is the Alexander operation, or the Olshausen as modified by Graves.

Ligation and resection of the pelvic veins has theoretically offered a cure, but unfortunately the immense sacculation that frequently takes place in the veins of the pampiniform plexus demands extensive dissection, and leaves a pathology which is not free from pain at the menstrual period.

In our experience simple ligation and resection of the ovarian vein has not given the relief claimed for it. Hysterectomy for this condition should include the removal of the ovaries, if we expect relief from the periodic pelvic congestion. Only by an extensive removal of the parametrial tissues can we hope by hysterectomy to effect a cure—and at once, we ask, is such an extensive extirpation justifiable in the presence of this lesion?

A careful review of this subject has brought out the following facts: (1) That pelvic varicosities in women are not uncommon during sexual maturity; (2) that repeated childbearing is a predisposing cause; (3) that the anatomic construction of the pelvic circulation favors venous stasis, and that subinvolution and uterine displacement increase this engorgement; (4) that varicosities may exist without any other pelvic pathology and occasion a train of symptoms, not unlike those of chronic pelvic inflammation, except that there is an absence of temperature and leucocytosis; (5) that rest in the recumbent position with the foot of the bed elevated, always relieves pelvic pain; (6) that continued pelvic engorgement leads to permanent pelvic pathology in the uterus, parametrium and ovaries; (7) that the treatment should be primarily preventive, i.e., proper care during the puerperium, includ-

ing repair of obstetric injuries, postural methods, pelvic depletion by local treatment, and correction of malpositions with pessaries, etc.; and (8) that the operative measures, such as suspension, ligation and resection, or hysterectomy are last resort procedures and do not always give the promised relief.

BIBLIOGRAPHY

Adami: Textbook of Pathology. *Andrews*: Surg. Clinics of Chicago, 1917, i, 505. *Behan*: Am. Jour. Surg., 1920, xxxiv, 106. *Castano*: Revista de la Asoc. med. Arg., xxvi, 5, abstr. in Jour. Am. Med. Assn., 1917, lxxviii, 1151 and 1514. *Chalier and Dunet*: Gynec. et Obst., Paris, 1920, i, 239. *Cotte and Jezditch*: Gynec. et Obst., Paris, 1923, vii, 205. *Darnall*: Jour. Am. Med. Assn., 1914, lxxii, 391. *Darnall*: Medicine and Surgery St. Louis, 1917, i, 624. *Dudley*: New York Med. Jour., 1888, xlviii, 174. *Emge*: Surg., Gynec. and Obst., 1921, xxxii, 133. *Engelmann*: Zentralbl. f. Gynäk. 1922, xlv, 329 and 1374. *Falk*: Arch. f. Gynec., 1907, lxxxii, 302. *Fothergill*: Brit. Med. Jour., 1921, ii, 925. *Kelsall*: Am. Jour. Surg. 1921, xxxv, 8. *Miller*: Zentralbl. f. Gynäk., 1922, xlv, 1370. *Moorhead*: Surg. Clinics, Chicago, 1920, iv, 259. *Rowse*: Brit. Med. Jour., 1921, ii, 1114. *Skene*: Medical Gynecology, 1895, Chapt. xiii. *Turner*: Lancet, 1917, i, 759.

20 LIVINGSTON STREET.

Selected Abstracts

General Gynecology

Winter: War and After War Casualties Among Women. Deutsche Medizinische Wochenschrift, 1922, xlviii, 64.

That the female population is adversely affected by war and its consequences as well as the male, is shown by Winter in this study. His figures cover the population of East Prussia, but he feels that they do not differ widely from those of other parts of Germany.

While there was an acute drop in the birthrate with the onset of war which remained low until its close, it rose as abruptly after the Armistice as it had fallen. It would now be back to normal if it were not for the increase in the number of abortions. Criminal abortions had been on the increase in Germany even before the war, but owing to the lax moral conditions prevailing since the revolution, they have increased in alarming proportions. Puerperal fever, which remained practically constant during the war, has increased markedly since the armistice, so that 18 cases occurred per 10,000 births in 1920 as against 9.2 in 1917. Winter attributes this to poor economical conditions as well as to the general lack of order which permeates all Germany. The number of stillborn infants has remained practically the same.

In common with other observers, Winter noted a marked increase in the cases of amenorrhea. This is ascribed to psychic influences, poor food and hard work. Strangely enough, this condition began to decrease rapidly as early as the middle of 1917 and has fallen steadily since. The number of cases of prolapse has also shown a marked increase, due mainly to hard work. Of considerable importance is the changed ratio of inoperable to operable carcinoma. While in 1913 the percentage of inoperability was 46, it rose to nearly 78 in 1919. This is due to the general apathy engendered by the war and its consequences. The number of gonorrheal infections in women is about seven times that which it was before the

war, while the number of luetic infections has at least been doubled. The point which Winter especially emphasizes is, that these conditions not only affect the period of hostilities, but extend for a long time after the conclusion of peace.

R. E. WOBUS.

Mayer, A.: *The Relationship of Obstetrics and Gynecology to the War*. Medizinische Klinik, 1922, xviii, 749, 787 and 820.

Mayer does not believe that the incidence of "war amenorrhea," was as great as many people believed. Numerous reasons were given for the occurrence of the amenorrhea, such as psychic influences, increased physical activity, undernourishment, both quantitative and qualitative, and sexual abstinence. The author, however, does not have much faith in these supposed factors. While most writers claimed that a secondary atrophy of the uterus was the anatomical substratum, Mayer believes the etiology to be a primary hypoplasia. Some authors maintained that conception was more favorable during the war, but the essential result was a diminution in fertility because the men were away. Noteworthy was the increase in the number of patients who complained of sterility after the war. In most of these women no cause could be found, although uterine hypoplasia was present in 20-25 per cent.

The percentage of unmarried mothers during the war rose from 8.6 per cent to 12.2 per cent. On the other hand, there was also an increased incidence of pregnancy in women who had had six and seven children. It was found that an increased number of gestations occurred especially in elderly primiparae and in elderly multiparae.

While many believed that more boys were born than girls during the war, the author could not substantiate this. Some authors even maintained that more girls were born than boys.

A study of the conceptions occurring during furloughs indicated that the optimum time for conception is during the first 14 days after menstruation. According to Siegel one may choose the sex of the child by selecting the time of conception in the menstrual cycle. The claim that pregnancy was prolonged during the war has not been proved.

Before the war there were 300,000 to 500,000 abortions yearly; but since the war the number has increased markedly. The increase in spontaneous abortions was due to difficult manual work, the stress of war, undernourishment and increase in venereal disease. The increase in the number of criminal abortions was astounding but there was also a large number of therapeutic abortions.

During the war there was a very appreciable decrease in the incidence of eclampsia. This was attributed to the diminution in the amount of fat and protein consumed, but disturbed nutrition does not explain everything. Mayer believes that enforced sexual temperance played a rôle and that eclampsia may perhaps be the expression of a sperm poisoning. He cites a few physical changes indicating sperm absorption even when conception does not take place. The increased incidence of eclampsia in primiparas is due to more frequent cohabitations early in married life and also to the fact that where the vaginal orifice is intact, there is a longer period of retention of sperm and therefore more time for absorption.

It was shown that during the war the general average weight of the children was slightly less than normal. There was also an increased incidence of spasmodophilia in the newborn, and in general the children did not thrive so well. The latter was probably due to the low temperature caused by the lack of coal. Despite all, there was not a very appreciable diminution in the ability of women to nurse

their babies, certainly not during the first 14 days. Of interest was the fact that the mortality of nurslings fell during the war.

During the war there were more spontaneous births and fewer operative deliveries than formerly. Furthermore complete lacerations and bladder fistulas almost disappeared. These facts may be attributed to the absence of physicians and hence to less premature interference with the processes of labor. The number of operative deliveries in the clinics, however, increased during the war and this is due to the increased frequency of premature rupture of the membranes and primary atony of the uterus. There was also noticed an increase in the duration of labor.

There was a definite increase in puerperal sepsis due to the inferior quality of the disinfectants used and also to the fact that the physicians who did obstetrics had to look, at the same time after soldiers with infected wounds. The infants born during the war showed an increase in the number of infections also.

There was a definite increase in the incidence of hypoplasia of the genitalia, due to a disturbance in the internal secretions of the ovary. There was also an increase in the occurrence of hernia and prolapsus uteri. Whether the frequency of carcinoma of the uterus was increased is debatable; but there was a definite increase in the number of inoperable cases. As regards myomata uteri it was found that there was a preponderance of soft myomata over firm ones, probably due to a deficiency of calcium in the diet. It was found that where lumbar anesthesia was used there were many marked reactions. The increase in gonorrhea was most pronounced but there was not a larger number of extrauterine pregnancies in consequence of this.

J. P. GREENHILL.

Sanders: Death in Married and Unmarried Women in the Middle Period of Life.

Nederlandsch Tijdschrift voor Geneeskunde, 1922, ii, 1782.

Sanders analyzed the deaths among women in Rotterdam from 1913 to 1921 inclusive. He found that the death rate among married women from 20 to 49 years is considerably higher than for unmarried women of the same period of life. Of the former, the annual death rate per 100,000 was 565 as against 497.7 among the latter.

The death rate from contagious and infectious diseases was less in married women, excepting that deaths due to influenza and pneumonia were much more common. The greatest difference in favor of married women was in the death rate from all forms of tuberculosis, which Sanders attributes to the fact that tuberculous women are not apt to marry. The same applies to a less degree to organic heart disease. The only other causes of death in which married women have a slight advantage are suicide and external violence.

Death from childbed fever, quite naturally, is almost 8 times as frequent in married women. It is not so apparent why the next greatest difference should be in death from unknown causes. Death from nephritis is twice as frequent in married women. Death from cancer is $2\frac{1}{2}$ times as frequent in married women and, strangely enough, the least difference is shown in cancer of the breast, the number being 5.7 and 10.9 per 100,000 respectively. Strangely enough, the preponderance of cancer in married women is about as great in the extragenital organs as it is in the genital organs, though the actual number is considerably greater in the former.

R. E. WOBUS.

Walthard, M.: Gynecology and Allied Disorders. Schweizerische Medizinische Wochenschrift, 1922, lii, 217.

Old ideas in which all ailments of the so-called "female disorders" are charged to the uterus are reviewed. The writer discusses the various phenomena connected with menstrual cycles and with pregnancy, such as nervous disturbances, an in-

crease in the carbon dioxide tension just before menstrual flow is established and so on. There may be however outside disturbances which have a bearing on the action of the ovaries and their allied organs, as e. g., tuberculosis, or Basedow's disease. In conclusion he argues that we must not attribute all female trouble directly to the internal genitalia but must at the same time carefully eliminate any other possible disturbance elsewhere in the body.

A. C. WILLIAMSON.

Culbertson: *The Relationship of Women's Diseases to the Chronic Patient.* Wisconsin Medical Journal, 1923, xxii, 59.

The author discusses his subject under six headings: (1) The physiologic disturbances; (2) Ectopic pregnancy; (3) New growths; (4) Mechanical defects; (5) Sterility, and (6) Pelvic inflammations.

Backache is probably the most frequent complaint we have to deal with and yet its cause is found more often elsewhere than in the pelvic organs. The distress due to general abdominal ptosis is extremely common and this fact should be learned early in his experience by every physician. Colitis is a more frequent cause of left-sided pain than is the left ovary and the same holds true for the appendix in relation to the right ovary. Also "neurosis" finds basis for its origin less in the uterus and ovaries than in the upper abdomen or in general systemic fault.

F. J. SOUBA.

Haendly, P.: *The Causes of Backache in Women.* Monatschrift für Geburtshilfe und Gynäkologie, 1923, lxii, 97.

Out of 500 women who came to Haendly for various ailments 128 (25 per cent) suffered from backache. Of these, 81 had enteroptosis, 20 had pelvic inflammations, 15 had retroflexio uteri, 4 had sciatica, 4 were pregnant and 4 had myomata uteri.

Only 34 out of the 81 women with enteroptosis had normal pelvic organs; hence in these cases the sole cause of the backache was the enteroptosis. Of the remainder, 28 had retroflexed uteri.

Not all women with changes in the internal genitalia have backache as evidenced by the fact that of 113 women with retroflexion, prolapse, inflammation, tumors, etc., only 39 had backache. The author believes that enteroptosis was the cause of backache in 60 per cent of his cases. In the remainder the causes were inflammation, anomalies in position of the uterus and vagina, sciatica, pregnancy and tumors. The backache in the patients with enteroptosis is due to fatigue of the muscles, while the backache which is due to changes in the genitalia may be attributed to stimulation of the vegetative nervous system. In patients with both enteroptosis and changes in the pelvic organs, the real cause can be determined from the anamnesis and the examination. If the cause is enteroptosis, pain will be produced when the abdominal wall is first elevated and then permitted to fall suddenly. In these cases a properly fitted belt should be tried before resorting to operation.

J. P. GREENHILL.

Mott, F. W.: *The Reproductive Organs in Relation to Mental Disorders.* British Medical Journal, 1922, No. 3195, p. 463.

The author considers the inborn characters of mind. He thinks that a tendency to depart from a well-balanced mind is largely a matter of inheritance. He enumerates three facts in relation to the causation of mental diseases: (1) The importance of a neuropathic and psychopathic heredity; (2) The special liability of the neuroses and psychoses to occur in adolescence and the involutive periods

of both the male and female sexes, when the sexual function matures and wanes; (3) The influence of childbearing and lactation in women.

The author quotes certain statistical data relating to inheritance and insanity in the periods of adolescence and involution. There are two schools of thought in relation to dementia precox: the psychogenic and the physiogenic.

F. L. ADAIR.

Donald, Archibald, and Buzzard, E. F.: *The Neurasthenic Element in Midwifery and Gynecology*. *British Medical Journal*, 1921, No. 3174, p. 699.

Functional disorders are especially apt to occur during puberty, during menstruation, during pregnancy and parturition, and at the menopause. The following subjective symptoms are discussed: (1) Pain, backache, iliac, and menstrual; (2) Fatigue. This may be due to digestive troubles or is purely a nervous symptom. Some cases are due to a sort of toxemia attended by grave constitutional symptoms; (3) Tenderness. As objective symptoms are mentioned: Bladder trouble with incontinence, retention, or frequency; irritation with itching, burning and definite skin lesions; amenorrhea; phantom tumor and enteroptosis. Any treatment should be avoided which is apt to aggravate new tendencies. One should be very guarded in prognosis and reluctant to operate in cases with a neurotic element.

The gynecologist should satisfy himself as to the presence or absence of structural defects. It is imperative that one be familiar with the symptoms of neurasthenia, with a knowledge of its underlying causes. One must consider the inherent factor of individual differences. Fatigue is an important factor in the production of neurasthenic symptoms. They are especially apt to develop between the ages of 35 and 45. This is the period of particular stress in a woman's life. Fear of disease is an important factor in developing neurasthenia in many women.

F. L. ADAIR.

Moll, A.: *So-Called Sexual Anesthesia of Women*. *Medizinische Klinik*, 1923, xix, 675, and 716.

Normally mild stimulation of the erogenous zones arouses sexual impulses. In women, the essential erogenous zones are the nipples, the neck, the clitoris, the labia minora and also the vaginal mucosa; but the last only in those who have had sexual intercourse. Such stimulation produces turgescence of the genitalia but this may also be produced psychically. Ejaculation, however, requires a different stimulus. The latter must be strong and it must be rhythmic and produced essentially by rubbing.

Women may have libido but no orgasm and, on the other hand, women may have orgasm without libido; but orgasms are commoner in those who have sexual desire. There are also many women who have no orgasm during sexual intercourse but who have orgasms very readily during masturbation. Many prostitutes, for example, masturbate.

There may be two reasons for this, first, the stimulation of the genitalia is not sufficient to produce an orgasm or the woman has no love for the man with whom she is cohabitating. Then there are women who have erotic dreams with orgasm but who have no orgasm during coitus. In some women there is a periodicity of libido, for example, at the end of menstruation.

By sexual anesthesia Moll means the lack of sexual desire. Many women complain of this and more who have sexual anesthesia say nothing about it; but severe conflicts in married life may result from this. Just as in man, there is one center for erection and another for ejaculation. For erection, in part psychic stimuli (visualization of the man) and in part somatic stimuli (mild irritation of the

erogenous zones) suffice. But these stimuli are not sufficient to produce ejaculation and orgasm, for there must be stronger stimuli and a definite individual rhythm. In some cases sexual desire is suppressed because in early life the child was taught to consider everything sexual as unclean and sinful. In other cases sexual anesthesia is congenital.

An important factor in sexual anesthesia is the lack of choice of the proper partner. Some women have no orgasm during coitus with their husbands, but are gratified by other men whom they really like.

A study of prostitutes revealed the fact that nearly all of those who had protectors with whom they had sexual intercourse, had orgasms during coitus with the protectors but with none of the patrons. Hence, it may be concluded that the mind plays an important rôle in the sexual gratification of women.

Local diseases of the genitalia may suppress sex desire. In women the clitoris appears to be an organ of desire. On the other hand, if during coitus the clitoris is not stimulated there is no orgasm. Masturbation may produce sexual anesthesia through elevation of the threshold of stimulation.

Moll believes that two-thirds of all women have sexual anesthesia. Sex desire and ejaculation are not necessary for conception. Out of 221 women with sexual anesthesia only 40 were sterile. Treatment depends upon the cause and to determine this a complete confidential history must be obtained.

J. P. GREENHILL.

Lipschutz: On the "Genital Papillae" of Women. *Wiener Klinische Wochenschrift*, 1923, xxxvi, 692.

The function of the labia minora depends on the sebaceous glands which they carry. These glands are not found in the fetus but appear during childhood, reach their greatest development during the fertile age, and then atrophy. The labia also afford protection against trauma and infection.

The author describes papillae found on the inner surface of these organs similar to those found on the tongue. Histologically they show tissue rich in capillaries resembling erectile tissue with many endbulbs of Krause scattered through it, the whole covered with thick or thin epithelium. Because of this picture and because they are found well-developed from the fourteenth year of age to the menopause, he feels that their function is similar to that of the clitoris.

FRANK A. PEMBERTON.

Binger: The Psychical Etiology and Treatment of Leucorrhea. *Therapie der Gegenwart*, 1923, lxiv, 346.

The author believes that besides the well known local pathologic causes of leucorrhea and its occurrence with constitutional diseases such as chlorosis, diabetes, etc., there is a form caused by psychical disturbances. The secretion from the glands of the cervix as well as from Bartholin's and the endometrial glands varies in amount. These glands are under the control of the autonomic nervous system as are the sweat, internal secretory, gastric and intestinal glands. Therefore they may be influenced by the psyche. Other stigmata found in such patients are pruritus, vaginismus, pelvic pains, and psychologic disturbances of menstruation. A few cases have been reported that were relieved by neurologic measures, hypnotism and suggestion.

The author discusses at considerable length the various psychical traumas to which women are exposed, especially from the sexual side. Fifteen cases are given in abstract which show good results with treatment by suggestion and persuasion. No definite pathologic cause could be found for the leucorrhea in any of them.

F. A. PEMBERTON.

Morawitz: A Few Relationships of the Blood to the Female Genitalia. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1924, lxxxvii, 278.

The author describes three cases of hemorrhagic diathesis, two of these belonged to the thrombopenic purpura (Morbus Werlhof), the other to the athrombopenic form. All three cases appeared in the premenstrual period, and the diathesis disappeared shortly after the beginning of menstruation. On the basis of these observations and a number of reports in literature, these hemorrhagic diatheses are regarded as of hormonal origin. It is probable that in the premenstrual period there is some influence of the corpus luteum upon vessel walls and blood forming organs (megakaryocytes) which may become manifest in a tendency to bleed. From the rather scarce reports in literature, the disease here reported differs from athrombopenic purpura in that, the bleeding occurred but once, so far as the cases have been observed.

MARGARET SCHULZE.

Puppel, E.: Disturbances in Vision after Hemorrhages from the Genitalia. *Monatsschrift für Geburtshilfe und Gynäkologie*, 1924, lxxv, 351.

The relationship between the eyes and genital disease is fairly close as demonstrated by eclamptic amaurosis, albuminuric retinitis in pregnancy, puerperal septic panophthalmitis, etc. Puppel reports 2 cases of blindness which occurred after uterine hemorrhage. The first patient had a large myomatous uterus and her eyesight improved markedly after hysterectomy. In the second patient the eyesight also improved considerably after hysterectomy. These are the only two cases the author has seen in the course of 20 years. He never saw blindness after postpartum hemorrhage and never saw it on the battlefield after severe hemorrhage. In the literature there are reports of about 300 cases like the two the author reports.

Many hypotheses have been brought forward to explain the blindness associated with genital hemorrhage but in the last analysis it appears that the anemia is the actual cause. All authors are agreed that the prognosis is bad unless the bleeding is stopped and this, according to Puppel, is best accomplished by vaginal total extirpation unless large tumors are present, when one must resort to abdominal hysterectomy. Those who believe the etiology of the blindness to be due to auto-intoxication through products from the ovaries, remove the ovaries.

Radiation is not advisable, because if applied during the hemorrhage it may cause an increase rather than a decrease of bleeding. Furthermore, if large doses are applied there is a fall in the hemoglobin content of the blood and anemic patients when radiated show a still further fall in the number of red blood cells.

J. P. GREENHILL.

Eufinger, H.: Death from Hemorrhage due to Excessive Menses in a Patient With Marked Diabetes Mellitus. *Monatsschrift für Geburtshilfe und Gynäkologie*, 1922, lviii, 1.

True diabetes mellitus is a rare complication of pregnancy because diabetic women seldom are fertile. In general, diabetes has little influence on menstruation and above all there is no relationship between the intensity of the diabetes and the severity of the menstrual disturbances.

While there is usually an amenorrhea or an oligomenorrhea, there are occasional cases of marked increase in menstrual bleeding which lead to mistaken diagnoses. The author cites the case of a 17 year old girl who had a profuse hemorrhage and whose condition was diagnosed as an abortion. Her menses had begun at 14 and had occurred regularly every four weeks. On only one occasion had there been a profuse period lasting eight days. On admission to the hospital she was in coma, almost pulseless. The urine contained sugar, acetone and diacetic acid. The

uterus was packed and the bleeding controlled, but the patient died suddenly three days later. At autopsy the uterus showed only menstrual changes, the pancreas the changes of diabetes, and all the organs were anemic. The cause of death apparently was anemia.

The author suggests that perhaps the diabetes arose from a disturbance in the equilibrium of internal secretion in which the relation between the pancreas and the generative glands appeared to play the greatest rôle.

J. P. GREENHILL.

Hartog: Gynecology and Rhino-Laryngo-Otology. *Nederlandsch Tijdschrift voor Verloskunde en Gynaekologie*, 1924, xxix, 256.

Hartog believes that congenital deafmutism is more often due to actual injury of the hearing mechanism during labor than is usually supposed. The injury may consist merely in hemorrhage into the labyrinth or cochlea and may be caused by undue pressure over the temporal bone as in awkward application of the forceps. While the deleterious effect of pregnancy on otosclerosis is well known, the actual *modus operandi* is still in the dark.

The danger of allowing pregnancy to proceed in a woman suffering from laryngeal tuberculosis, Hartog feels, is not sufficiently appreciated by obstetricians. Even if such a patient should survive a pregnancy, he urges sterilization to avoid further conception.

While dysmenorrhea is at times relieved by nasal applications of various kinds, neither the review of the literature nor his own experience have convinced Hartog of the existence of definite "genital spots" in the nose. The congestion of the nasal mucosa sometimes encountered during menstruation is rather an expression of general circulatory changes incident to menstruation than of any relationship between the nose and the genitalia.

R. E. WOBUS.

Brakemann: Changes of the Female Genitalia in Lymphatic Leukemia. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1923, lxxxvi, 23.

There is very little literature upon the subject of the leukemic changes in the female genitalia. The disease is only half as common in women as in men, yet is not so rare but that one should expect to find involvement of the genitalia in a considerable number of cases. It has been found, however, that even where profuse and uncontrollable hemorrhages from the vagina focused direct attention on the genital tract, the gross anatomical findings were often entirely negative, even where later histologic investigation showed extensive infiltrations in all the organs of the genital sphere.

The author describes a personal observation. In a 31-year-old nulliparous woman symptoms began in July, and included mouth, nasal and vaginal hemorrhages. She died in October. Typical leukemic changes were found in liver, spleen, lymphnodes, etc. The pelvic organs showed the following changes: The uterus was of normal size but of firm consistency; the cavity filled with blood; the tubes were thickened with open fimbriated extremities, and their lumina also contained blood clots. The right ovary was enlarged to the size of a watch, with dilated thrombosed vessels in the mesovarium and infundibulopelvic ligament. On section, the ovary showed extensive interstitial hemorrhages, with only a few corpora fibrosa and one old corpus luteum remaining as recognizable normal structures. The left ovary was moderately enlarged but aside from this showed no gross changes.

The right ovary showed microscopically an intense vascular congestion with marked hemorrhagic extravasation into the tissues and such a diffuse infiltration with lymphocytes that under high power the picture was that of a hyperplastic

lymphnode. These changes were most marked in the medulla, the tunica albuginea and outer portions of the cortex were free of all cellular infiltration and showed isolated unchanged primordial follicles. The mesovarium showed large thrombosed vessels containing islands of lymphatic elements. The left ovary showed similar changes except that the hemorrhagic extravasation was absent.

The tubes showed a lymphocytic infiltration, especially of the tunica propria of the mucosa and the connective tissue of the mesosalpinx. The tube lumen was filled with an organizing thrombus. Both cervix and corpus uteri showed lymphocytic infiltrations between the muscle bundles. Only a small amount of the basal layers of the endometrium was still present. Both the portio vaginalis and the vagina had large defects in the squamous epithelial covering and a dense lymphocytic infiltration of the subepithelial layers.

The author concludes with a brief review of the literature, including a number of cases where lymphatic leukemia developed during pregnancy, or where leukemic women became pregnant.

MARGARET SCHULZE.

Ludwig and Lenz: The Action of Drugs on the Uterus as viewed Through an Abdominal Window. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1924, lxxxvii, 92.

This article describes the action of various drugs upon both pregnant and non-pregnant uteri of rabbits and cats, as observed through a celluloid window sewed into the abdominal wall in the manner described in a previous article.

The first drug employed was adrenalin in a dosage of 0.15-0.3 c.c. of a 1:1000 solution, intravenously in the rabbits and subcutaneously in the cats. The results were practically the same in the two animals, but markedly different in the pregnant and nonpregnant uteri. There was an immediate cessation of all uterine motions in nonpregnant animals. The uterus remained for a period of five to fifteen minutes in the same state of tonus it was when the injection was made whether this happened to be one of contraction or of relaxation. The uterus became extremely anemic, taking on a snow-white color which showed up in marked contrast to the intestinal coils, which developed a far less marked anemia. Following the acute adrenalin reaction which lasted about 15 minutes, the uterus developed patchy and then marked generalized hyperemia, peristaltic contractions reappeared and in 30 to 40 minutes the whole condition had returned to normal.

In the pregnant animal, the result was almost the exact opposite. There was an increase in peristalsis and the appearance of deep tonic ring-contractions. There appeared a moderate anemia, which was definitely less marked than in the non-pregnant uterus. After about 15 minutes, both contractility and circulatory conditions returned to normal.

Pituitrin was next used in doses of 0.5 intravenously in both cats and rabbits. The results showed that in both the gravid as well as the nongravid uterus, the main result of pituitrin was a tetanizing one. Pituitrin causes an immediate cessation of all peristaltic uterine activity. The whole organ shows a maximum tonic concentric contraction and falls into a complete lasting tetanus which leads to a very well-marked striking anemia. This phase lasts about ten minutes and then gradually goes over into a second one which is characterized by the alternation of a generalized state of relaxation and of tonic contraction and the formation of deep, more or less numerous tonic contraction rings, without any indication of peristalsis. The third phase is characterized by the occurrence of a cylindroid peristalsis, in which contractions of the longitudinal musculature travel as waves down the organ. The circular musculature, however, shows no definitely visible peristalsis. Relaxation and tetanic contractions alternate, and lead in places to the formation of well-marked contraction rings. After the first phase, the cir-

ulation of the uterus is improved, and during the stage of relaxation is very markedly hyperemic.

Placental extract shows practically the same characteristic action, both on the gravid as well as the nongravid rabbit and cat uterus. Doses of 0.2-2 c.c., given intravenously or subcutaneously, influenced particularly the normal forms of peristalsis so that these became much more intense, longer lasting and more frequent so that the whole organ seemed almost constantly in motion. There was a uniform rhythmic peristalsis of the circular as well as the longitudinal musculature, in which the deep ring contractions disappeared almost entirely. The blood vessels are slightly dilated and the circulation of the organ is increased.

Sekakornin and gynergen in doses of 0.5 to 2 c.c. given intravenously or intramuscularly produced practically the same action on gravid, puerperal and nongravid rabbit uteri. The action could be divided into four phases: first, a phase of maximum tonic concentric contraction which lasted about three minutes. This was followed by the appearance of stable non-moving sharply demarcated ring contractions, without any sign of relaxation or of peristalsis. This phase lasted about twenty minutes and was followed by another of deep annular peristaltic waves, with increased general tonus, lasting about one and a half hours and finally followed by a period of increased, very strong, normal, general peristalsis with permanently increased tonus.

Uteramin (p-oxyphenyläthylamin) in doses of 0.1 to 1.0 c.c. intravenously produces in the puerperal as well as in the normal rabbit uterus, a sudden marked tonic contraction without increased motility. The organ appears much stiffer but is well supplied with blood. This period lasts for about ten minutes, then there appear strikingly strengthened, prolonged and more frequent pro- and antiperistaltic waves of the normal type without very marked formation of contraction rings, and the general tone remains increased for an hour or more.

Atropin sulphate, 0.005 gm. intravenously, causes after a few minutes in the normal nonpregnant rabbit uterus a complete relaxation of the organ (a marked decrease in tonus) with a definite decrease in peristalsis. The action is very prolonged, lasting many hours.

These results, then, show that the various drugs produce markedly different specific actions on the motility of the uterine musculature, and may explain the marked difference in their clinical action in the human.

MARGARET SCHULZE.

Ogilvy: The Afferent Nerve Supply of the Female Genito-Urinary Organs and the Bowel. *The Practitioner*, 1920, cv, 421.

The author attempts to localize various types of pelvic pain according to afferent nerve distribution in view of their embryonal development: "It appears to me that the tenth thoracic nerve supplies the functioning portion of the kidney, the ovary and the small bowel—all of which are highly functioning; that the eleventh thoracic nerve supplies the upper branching extremity of the ureter, the uterine tube and the ascending and transverse colons; the twelfth thoracic nerve supplies the ureter, the uterus and the descending and sigmoid colons, all of which are comparatively passive carriers, except for the absorbing function of the large bowel; that the first lumbar nerve supplies the bladder, rectum and uterus, all of which are organs of convenience; and that the third and fourth sacral nerves supply the trigone and urethra, the os and vagina, and the anal canal, all of which are outlets."

The only difficulty in accepting such a definition is that no account is taken of "traction on the splanchnics" in displacements nor on the referred pains in different lesions of the generative and urinary systems which do not conform to the areas served by a single posterior root nerve.

A. N. CREADICK.

Lubosch: The Development of the Ligamentum Uteri Teres and the Inguinal Region in the Human. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1924, lxxxvii, 467.

The author gives a brief review of the literature and a sketch of the embryology of this region with a number of illustrations. MARGARET SCHULZE.

Dretl: A Contribution to the Biology of the Cervix. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1924, lxxxvii, 447.

The author made his studies upon cervical secretion obtained under special precautions to avoid bacteriologic or chemical change. He found that he could prove the presence of amylase, which split off maltose from starch. The fermentative power was highest in the premenstrual period, much weaker in the postmenstrual, weakest in the intermenstrual. The diastase appeared to be formed in the cervix, since the fundus uteri after hysterectomy never showed the presence of the ferment. The cervical secretion shows an amphoteric reaction, in the premenstrual period, the acid content increases, the alkalinity decreases, in the intermenstrual period the reverse holds true. The varying fermentative power probably depends upon an activation in the presence of acid, and a crippling by an excess of alkali.

MARGARET SCHULZE.

Emge: Varicose Veins of the Female Pelvis. *Surgery, Gynecology and Obstetrics*, 1921, xxxii, 133.

Emge thinks that varicose veins of the broad ligament, and especially in the ovarian circulation, are quite common and are the cause of considerable pain and discomfort. To aid in their diagnosis he makes a vagino-rectal examination alternating in the recumbent and sitting position.

Mild cases, in his opinion, can be permanently relieved by conservative measures, while high suspension of the uterus with shortening of the uterosacral ligaments offers the best means for permanent symptomatic cure. Resection of the veins and hysterectomy are superfluous.

R. E. WOBUS.

Fothergill, W. E.: Varicocele in the Female. *British Medical Journal*, 1921, No. 3179, p. 925.

Anatomists describe five plexuses of veins in the female pelvis: the vaginal, the uterine, the vesical, the hemorrhoidal, and the pampiniform plexus. Venectasies are often seen with chronic inflammatory conditions and neoplasms. The common symptom is a dull aching pain, low down in the left side, often in both sides. This is often preceded by a congestive dysmenorrhea. The pain is usually made worse by constipation. Diagnosis is made from the symptoms in the presence of some of the causative factors. It may be possible to feel the veins especially with the patient in standing or sitting posture. At present there is no local or surgical treatment available. Therapy consists mainly of palliative measures, careful personal hygiene, regular exercise, avoidance of constipation and avoidance of improper work.

F. L. ADAIR.

Dales: Rectal Examination in Gynecology. *Le Progrès Médical*, 1924, No. 6, p. 77.

In an article accompanied by six diagrammatic illustrations the author brings out the value of rectal examination in gynecologic cases. He finds this method of examination to be especially useful in the replacement of retroversion either

with or without adhesions, in the examination of pelvic tumors located low in the pelvis, and in following the progress of labor in obstetrical cases.

The reason for its advantage in the first two conditions is that the examining finger can pass higher into the pelvis thus more definitely outlining the organs present than by the vaginal route, where the examining finger is stopped by the vaginal wall of the posterior fornix. The advantage in obstetrical cases is that it permits the obstetrician to closely follow the progress of any case without submitting the patient to the dangers of infection.

THEODORE W. ADAMS.

Pitcher, H. F.: *Pruritus Ani et Vulvae*. American Journal of Electrotherapeutics and Radiology, 1922, xl, 51.

Twenty-three cases of *pruritus ani et vulvae* have been treated with ultraviolet light. The relief of itching was instantaneous and the recovery permanent, in some of the cases extending as long as two years. In the preparation of the patient, all hairs are closely cut. The affected parts are thoroughly cleansed with soap suds, carefully dried, and all crusts removed. Any redundant perianal folds which may serve as hiding and breeding places for bacteria, are smoothed out with gloved hands so that the light may sterilize all of the recesses. The healthy skin must be protected and a careful plan of application mapped out so as to avoid overtreatment of any one place. The light is applied by means of the Kromayer Quartz Lamp at a distance of 3 inches. Beginning with four minutes, each subsequent treatment lasts one or two minutes longer. Three treatments are given the first week, two the second week, and one every one to two weeks as occasion requires. The average number of treatments required to make the cure permanent, ranged between six and twelve.

GEORGE GELLHORN.

De Aragon: *Filarian Elephantiasis of the Vulva*. Revista Cubana de Obstetricia y Ginecologia, 1920, ii, 12.

This case is reported by the author under the title of "verrucous elephantiasis of the vulva." It is however of more interest to call attention to the filarian origin of the condition, for verrucous elephantiasis in the temperate climates is not due to this or apparently to any other parasite. The patient was a white girl of 18 years. She had a vaginal leucorrhea which was readily distinguished from an infectious vulvo-vaginitis. There was a history of slow enlargement of the labia majora and the parts were covered with verrucae. The occurrence of painful crises with fever up to 104, chills and headache suggested filarial infection. These crises were in no way associated with the menstrual epochs. In the past few months the patient had been losing much weight and complained of insomnia. She had the melancholic facies. Examination of the external genitals showed no anomalies of development. The labia majora were two or three times the normal size but the deformity was far less marked than in the usual book illustrations. The warty masses were arranged in groups and the warts were of various sizes. They extended in front to the mons and laterally to the groin on the right side. At the posterior portion of the labia the warts were ulcerated with an offensive discharge. Although the presence of the febrile attacks made the diagnosis almost certain, hemoculture was practised and embryos of the *filaria Bancrofti* were found present. Treatment consisted in excision of the labia, followed by suture.

GRAFFIANO.

Peterson: *Obstetrics and Gynecology from the Standpoint of the General Practitioner.* Ohio State Medical Journal, 1921, xvii, 538.

A general article which covers the drifts in the practice of medicine, the requirements for specialization and general practice; groups and clinics; the rôle of the general practitioner; obstetrics and gynecology in relation to the general practitioner, and finally the futility of state medicine. The author concludes that "the general practitioners have been fooling themselves when they have the game in their own hands. This country is not looking for specialists, they are to be found on every corner. What the country wants is more family doctors."

W. K. FOSTER.

Watson, B. P.: *The Past, Present, and Future of Midwifery.* British Medical Journal, October 21, 1922, p. 712.

The author briefly sketches the history of the Chair of Midwifery in the University of Edinburgh. It was instituted February 9, 1726. No other medical school had at that time established such a professorship, Strasburg following only in 1728. He calls attention to the necessity for reducing both maternal and fetal deaths, especially those due to infection. He points to the necessity for antenatal care of the prospective mother, and emphasizes the importance of postnatal clinics. Finally he dwells on the urgent need for improvement and enlargement of the Royal Maternity Hospital of Edinburgh.

F. L. ADAIR.

Item

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS

The following Officers of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons were elected for the year 1924 and 1925.

President: Dr. Asa B. Davis, New York City, N. Y.

First Vice President: Dr. William E. Darnall, Atlantic City, N. J.

Second Vice President: Dr. Henry Schmitz, Chicago, Ill.

Secretary: Dr. James E. Davis, Detroit, Mich.

Assistant Secretary: Dr. G. V. Brown, Detroit, Mich.

Treasurer: Dr. Wm. G. Dice, Toledo, Ohio.

New Members of the Executive Council: Dr. James F. Baldwin, Columbus, Ohio, and Dr. E. A. Weiss, Pittsburg, Pa.

Books Received

HANDBUCH DER GEBURTSHILFE. In drei Bänden und Ergänzungsband. Herausgegeben von A. Doederlein, München. Erster Band mit 279 Abbildungen im Texte und 4 Tafeln. Zweite Auflage. Verlag von J. F. Bergmann, München, 1924.

THE INTERNAL SECRETIONS. For the use of students and physicians. By Dr. Arthur Weil, Assistant Professor of Physiology, University of Halle. Authorized translation of third German edition by Jacob Gutman, M.D., etc. Director Brooklyn Diagnostic Institute. The Macmillan Co., New York, 1924.

BIOLOGIE UND PATHOLOGIE DES WEIBES. Handbuch der Frauenheilkunde und Geburtshilfe. Herausgegeben von Josef Halban, Wien, und Ludwig Seitz, Frankfurt a.M. Lieferung 10. Urban und Schwarzenberg, Berlin und Wien, 1924.

GREFFE ANIMALE, ses applications utilitaires au Cheptel. Par le Dr. Serge Voronoff. Directeur du laboratoire de chirurgie expérimentale du collège de France, etc., Avec 59 planches dans le texte. Librairie Octave Doin. Paris, 1925.

INTERNATIONAL CLINICS. Volume III. Thirty-fourth Series, 1924. J. B. Lippincott Company, Philadelphia, 1924.

LEHRBUCH DER OPERATIVEN GEBURTSHILFE. Von Professor Dr. Sigfrid Hammerschlag, Direktor der Brandenburgischen Hebammenlehranstalt und Frauenklinik in Berlin-Neukölln. Zweite neubearbeitete Auflage. Mit 200 Abbildungen. Verlag von S. Hirzel, Leipzig, 1924.

DIE MIKROSKOPISCHE AUSRÜSTUNG DES ARZTES. Von F. W. Oelze, Privatdozent fuer Dermatologie an der Universität Leipzig. Mit 126 Abbildungen im Texte. Verlag von Leopold Voss, Leipzig, 1924.

DIE KLINIK DER BOESARTIGEN GESCHWÜLSTE. In drei Bänden. Herausgegeben von Geh. Rat Professor Dr. P. Zweifel and Geh. Med. Rat Professor Dr. E. Payr. Erster Band. Mit 204 Textabbildungen und 33 farbigen Tafeln. Verlag von S. Hirzel, Leipzig, 1924.

ULCUS VULVAE ACUTUM. Von Dr. B. Lipschuetz, Privatdozent an der Universität Wien. Mit 23 Abbildungen im Text. Verlag von Leopold Voss, Leipzig, 1924.

HANDBUCH DER KINDERHEILKUNDE. Herausgegeben von Professor Dr. M. von Pfaundler in München, und Professor Dr. A. Schlossmann in Düsseldorf. Vierter Band, dritte Auflage. Mit 8 Tafeln und 163 Textfiguren. Verlag von F. C. W. Vogel, Leipzig, 1924.

The American Journal of Obstetrics and Gynecology

VOL. VIII

ST. LOUIS, DECEMBER, 1924

No. 6

Original Communications

CARBOHYDRATE METABOLISM DURING PREGNANCY AND THE VALUE OF INSULIN TO THE OBSTETRICIAN*

BY HUGO EHRENFEST, M.D., F.A.C.S., ST. LOUIS, MO.

AS early as 1895, v. Jaksch and also Lanz had ascertained that pregnant women are likely to respond with a glycosuria to the intake of 100 grams of glucose, and already Lanz had spoken of the possible usefulness of this phenomenon in the diagnosis of pregnancy. These findings were fully confirmed by Hofbauer, in 1899. Though again carefully studied by Stolper, Payer, Reichenstein and others between 1909 and 1911, this problem actually did not attain its present general interest among obstetricians until Frank and Nothmann published their first paper on this subject in 1920.¹ They explained the almost typical appearance of a glycosuria, especially early in pregnancy, after a dose of 100 grams of glucose on a fasting stomach on the basis of a renal diabetes. Kamnitzer and Joseph² changed this diagnostic test, seemingly without impairment of its value, by giving 75 grams of rice with 100 grams of cane sugar. They also ascertained a markedly increased tendency of pregnant women to develop a phlorizin glycosuria. Brinitzer³ confirmed earlier observations of Christofoletti and of Ryser concerning the fact that adrenalin during pregnancy will cause a glycosuria when given in a dose which, as a rule, proves too small to yield this same effect in a nonpregnant woman, a fact fully confirmed by Jaeger.⁴ On these findings Roubitschek⁵ based his pregnancy test: one-half c.c. of a 1:1000 adrenalin solution, followed by 10 grams of dextrose given in 250 grams of tea. Kuestner^{6, 7} thought that some of the failures with the Roubitschek test might be

*Presented by invitation before the Chicago Medical Society, May 28, 1924.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

due to the inability of the injected adrenalin to stimulate glycogenolysis, if the preceding starvation had greatly reduced the glycogen contents of the liver. He, therefore, suggested the following modification: Not too long after the last meal, 10 grams of dextrose are given in 200 c.c. of water or tea, and only 15 to 20 minutes later 0.5 mg. of adrenalin is injected. Since he saw a glycosuria appear with a blood sugar concentration as low as 0.082, and at an average level of 0.141, he agrees with Frank's contention⁸ that this pregnancy phenomenon can be explained solely as a renal diabetes, to which Hofbauer⁹ agrees.

The validity of this explanation, however, has been doubted by other investigators. The glycosuria thus artificially produced, as a matter of fact, is always preceded by a hyperglycemia. Frank stresses the point that this hyperglycemia never transgresses the 0.2 point. Bauer¹⁰ in 200 cases noted a rise from about 0.08 to about 0.2, and Zondek¹¹ actually discarded the Frank-Nothmann test for the very reason that he observed an occasional rise above 0.19. Frank's claim that this test reveals an abnormal permeability of the kidney for sugar during pregnancy, i.e., a physiologic condition identical with renal diabetes, is based on his assumption that the normal renal threshold is 0.19. Rather generally it is now believed that considerable variations exist in this respect in normal healthy individuals, but the normal renal threshold is placed, e.g., by Macleod¹² at a blood sugar concentration of 0.17. For this reason of late more often this peculiar phenomenon of pregnancy is referred to as an alimentary hyperglycemia and glycosuria *e saccharo*. However, as emphasized by Dietrich¹³ even this is not entirely correct since already Novak, Porges and Strisower¹⁴ had demonstrated that pregnant women are likely to develop also an alimentary glycosuria *ex amylo*, which according to the investigations of Eisner and Fortner it is impossible to produce in a nonpregnant, nondiabetic woman.

We, therefore, must conclude that it is not justifiable to speak of this peculiar and fairly common derangement in the carbohydrate metabolism of pregnant women either as a renal diabetes or as an alimentary glycosuria within the usual clinical meaning of either term.

Before I offer my own explanation of this condition, I wish to emphasize that this anomaly is not discovered in every pregnant woman or in all stages of pregnancy of the same individual, and that the various tests here mentioned are not by any means absolutely reliable. The outcome of such a test, however, rather generally is considered as excluding the diagnosis of pregnancy whenever it fails to produce a glycosuria. It is well known that a positive result with the test may be dependent upon various other conditions outside of pregnancy. Nuernberger,¹⁵ e.g., finds the Frank-Nothmann test very valuable, as does Nothmann¹⁶ in a summary of all results so far recorded in literature. Jensen¹⁷ considers it of some value, Seitz¹⁸ as too unreliable.

Kamnitzer and Joseph¹⁹ object to the adrenalin test on account of its disagreeable effect on the patient. Their own phlorizin test yielded satisfactory results in the hands of Leskinen²⁰ but proved disappointing to Long and Hirst.²¹ Hellmuth²² found all the tests unsatisfactory, as does Williams,²³ while on the other hand they prove a valuable diagnostic aid in the experience of Welz.²⁴ We find many writers recommending the phlorizin test, e.g., Burger,²⁵ Houet, Pouget and Miloehevitch,²⁶ Koster,²⁷ Lewin,²⁸ Sacharoff,²⁹ Seheffel,³⁰ Sehillling and Goebel,³¹ or Zondek,¹¹ though, e.g., Hollingworth³² and others find it but little dependable. Interesting is the suggestion of Lembke and Lindig³³ that discrepancies in the results of the same test in the experience of different observers might be due to racial differences among patients of various countries.

This widespread interest in the diagnostic value of an artificial glycosuria has during the past three years yielded information which, in my belief, greatly advances our understanding of carbohydrate metabolism and its physiologic alterations during pregnancy.

In the attempt to present here this newer knowledge I shall speak first of morphologic and functional changes which in the course of pregnancy occur in organs that control sugar metabolism, namely, the liver, the various endocrines and the vegetative nervous system. On the basis of these changes I shall endeavor to explain the problem of the maintenance within normal limits of blood sugar concentration in the pregnant woman and the evident alteration during pregnancy of the level at which under certain conditions sugar is permitted to flow over into the urine.

LIVER

In spite of much adverse evidence the idea of typical changes in the liver tissue during pregnancy, based chiefly on the pioneer work of Hofbauer, is still prevalent. The term, "liver of pregnancy," expressing a definite analogy to the "kidney of pregnancy," is freely employed in obstetric literature.

In the light of present information, however, much of the evidence accepted by older investigators as conclusive for a reduced glyco-genetic ability, today is almost valueless. Indeed, the investigations of Staub and Rosenberg have established that one large dose of sugar, formerly considered the best test in ascertaining liver function, stimulates the liver cells and thus actually eliminates any possibility of differentiating with it between an insufficient and a normal hepatic function.

Isaacs had shown that levulose might be more usefully employed as a functional liver test. Gottsealk and Strecker^{34, 35} discovered that a dose of only 100 gr. of levulose, insufficient to cause a glycosuria in a nonpregnant woman, will in a large percentage of pregnant

women lead to a hyperglycemia and glycosuria. This proved in their belief a physiologic impairment of hepatic function during pregnancy. Similar observations were recorded by Jaeger⁴ and others, and also by Hetenyi and Lieberman.³⁶ These last mentioned two investigators, however, pointed out the obvious fact that while possibly acceptable as proof of liver deficiency in man or the nonpregnant woman, the positive outcome of the levulose test is deprived of all its significance in pregnant women because in them very often the kidney becomes markedly more permeable for all sugars. In comparative experiments they found that normally the renal filter proves less dense for levulose than glucose.

Widal's test of hemoelastic crisis, a symptom complex characterized chiefly by a leucopenia following the intake of 200 gr. of milk, was employed to test liver function during pregnancy. Kaboth³⁷ found that a positive reaction occurs decidedly more often in pregnant than in nonpregnant women. It is invariably positive in cases of marked toxicosis and especially of eclampsia. All we, therefore, can say is that during pregnancy at least the proteopexic function of the liver is impaired in many women, of course granted that this test of Widal really is a true indicator of impaired hepatic activity, which is denied by some authors. In the investigations of Powilewicz (quoted by Vignes³⁸) the test was negative in less than half of all pregnant women, a figure practically identical with that ascertained by Nuernberger.³⁹ Didier and Philippe⁴⁰ found the positive tests percentually to increase the further pregnancy is advanced. This alimentary leucopenia, in my opinion, at least proves a fairly common dysfunction of metabolism and of the vegetative nervous system during pregnancy, a fact not without its significance in the problem here discussed.

Reports from various investigators (Williams,⁴¹ Rosenfield and Schneiders⁴² and others) show that liver function, as expressed in the outcome of the phenoltetrachlorophthalein test, seems approximately normal in healthy pregnant women, but apparently is impaired in the presence of toxic complications.

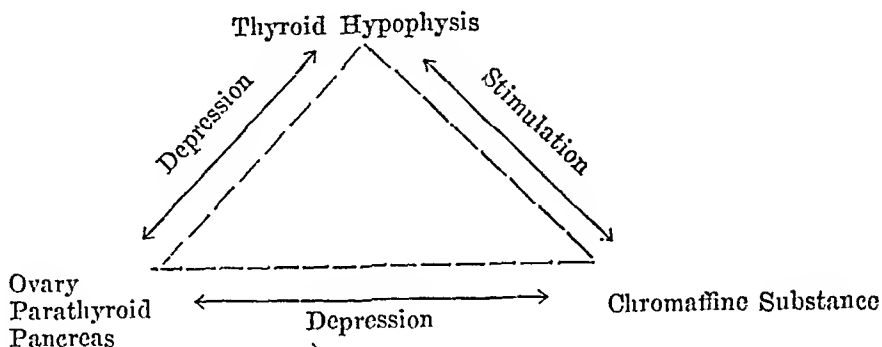
Wesselow,⁴³ in a most exhaustive study of the question, arrives at the conclusion that we seemingly do not possess a definite and reliable method of testing hepatic function. Even a combination of various methods of study, in the opinion of Hetenyi and Lieberman³⁶ fails to furnish convincing proof of a physiologic hepatic insufficiency during pregnancy, and Schiebele⁴⁴ asserts that the conception of a "liver of pregnancy" cannot be definitely described in histopathologic terms.

I must emphasize that these last quoted authorities are referring only to the absence of physiologic changes but do not deny liver derangement in the presence of toxic conditions, which are fairly common in pregnancy. At least for them we might assume, though the fact has never been convincingly established, that morphologic altera-

tions could account for impaired function of the organ also within the carbohydrate metabolism process.

ENDOCRINES

It will be advantageous to reproduce here the well-known diagram of Aschner which so clearly indicates both the stimulating and depressing influences exerted by the various endocrines on each other in their relation to carbohydrate metabolism.



(a) *Thyroid*.—As indicated in this diagram the thyroid stimulates the adrenals but depresses pancreatic function. More recently this has been clearly shown in the results of the studies of Olmstead and Gay.⁴⁵ "Increased thyroid activity leads to increased metabolism, and to a delay in glycogenesis or augmented glycogenolysis."

What do we know concerning thyroid changes in pregnancy?

Various observers have recorded a palpable enlargement of the thyroid in about 75 to 80 per cent of all pregnant women. This high percentage of enlargement can be interpreted only as response to a specific need for thyroid output made by pregnancy. Engelhorn in exact histologic investigations has shown that both in animals and the human, during pregnancy hypertrophic and hyperplastic changes with increased colloid formation can be demonstrated. Also certain clinical observations support the idea that during gestation an increased supply of thyroid hormones is essential. Patients with evidently defective thyroids, suffering from cretinism, myxedema or cachexia strumipriva, are noticeably harmed by an intervening pregnancy. On the other hand, hyperthyreotic patients, cases of Basedow not severe enough to have led to amenorrhea and sterility, according to French writers and in the experience of Kocher, almost as a rule, are temporarily benefited by pregnancy.

An increased thyroid function, therefore, can be accepted as an established physiologic phenomenon of pregnancy.

(b) *Parathyroids*.—Within the process of carbohydrate metabolism the parathyroids act in the same sense as the pancreas. This fact is firmly supported by the experiments of Underhill and Blatherwick.⁴⁶

Removal of the parathyroids causes glycosuria and reduces the assimilation limit for carbohydrate.

There is evidence available to show that pregnancy demands an increased supply of parathyroid hormones and that insufficiency of these glands is responsible for the development of tetany. Animals from whom a part of the parathyroid tissue has been removed exhibit the typical signs of tetany when becoming pregnant, as shown by Vassale, Erdheim,⁴⁷ Adler and Thaler.⁴⁸ Several instances have been recorded of the appearance of tetany in pregnant women on whom a strumectomy had been performed, presumably with incidental injury to the parathyroids. They all recovered promptly after labor.

We, therefore, know that in some women parathyroid function during pregnancy becomes markedly deficient but at present we have no evidence that this factor actually plays a rôle in the anomalies of carbohydrate metabolism during pregnancy.

(e) *Adrenals*.—The importance of the adrenals in the process of sugar metabolism is so well known that I can limit myself to but a few quotations from Macleod. Epinephrin acts on glands and muscles in the same manner as does stimulation of their sympathetic nerve supply. This is most pronounced in its effect on metabolism. Injection of epinephrin excites glycogenolysis in the liver and thus leads to hyperglycemia and glycosuria.

In many ways increased sensitiveness of the pregnant woman to adrenalin has been demonstrated. The often mentioned view, however, of a physiologic adrenalinemia of pregnancy certainly is not based on conclusive proof. Of greater value in this respect might be the claim of Sestini (quoted by Vignes), so far neither confirmed nor disproved, that a distinct adrenalinuria appears in the fourth month of pregnancy which gradually increases up to term. He asserts that there exists an evident parallelism between the amount of adrenalin in the urine and the degree of pigmentation of the patient's skin.

Mention already has been made of the fact that a marked susceptibility of pregnant women to adrenalin forms the basis of some of the tests devised to aid in the diagnosis of early pregnancy by the production of an artificial glycosuria. Noteworthy in this connection are the experiments of Deluca.⁴⁹ He found that after the injection of pilocarpin or of the extracts of adrenal, thyroid, pituitary or ovaries, the rise in the blood sugar was most pronounced subsequent to the injection of adrenalin. This substance, in his opinion, necessarily proved most potent because of its specific effect on the mobilization of glycogen stored in the liver.

Summarizing all available information, we are justified in deducing that the adrenals probably of all pregnant women are in a state of hyperactivity. Considering in particular the well established fact, that even a small dose of epinephrin, especially with the addition of

but 10 grams of glucose, causes a glycosuria in so large a percentage of pregnant women (97 per cent according to Kuestner⁷) we may conclude that the adrenals play a very important rôle in the seemingly lowered sugar tolerance of pregnancy. The condition is apparent in the very earliest stages of pregnancy and no other organ participating in carbohydrate metabolism is likely to react so very promptly to the change of conditions brought on by impregnation. That the adrenals react almost instantaneously is amply proved by the immediate appearance of a glycosuria after a sudden and profound emotion. That this glycosuria is the result of a prompt output of adrenalin is definitely established by the fact that it fails to appear if the adrenals have been removed (Bauer⁵⁰).

(d) *Ovaries*.—Though a great number of different extracts obtained from ovarian tissue have been extensively studied, ideas concerning their physiologic action today probably are more obscure than ever before. The very use of the terms hyperfunction or hypofunction in regard to the ovaries is scientifically incorrect, because the ovary undeniably produces various hormones, very different in their action, any one of which, in certain phases of ovarian activity, might be—completely or only partially—present or absent. Fellner,⁵¹ e.g., claims to have isolated three biologically differing substances of which at least one, in animal experiments, manifests the striking ability of preventing a typical adrenalin glycosuria. Since in pancreatectomized animals this particular hormone failed to reduce the hyperglycemia, he concluded that this ovarian substance simply acts as a stimulant of pancreatic endocrine function. Wuerzler⁵² fully confirmed former experiments of Baillo on rabbits, which show that after removal of all ovarian tissue these animals prove particularly sensitive to many of the known stimuli which cause a rise of blood sugar. He also ascertained this same sensitiveness in castrated women, an observation previously recorded by Guggisberg⁵³ and probably first thoroughly studied by Stolper.^{54, 55}

It will be of no advantage to cite here other experiments and clinical observations demonstrating a relation of ovarian function to carbohydrate metabolism. They have mostly been made by obstetricians and might not be absolutely convincing to the physiologist. However, I must refer more in detail at least to the experiments of Kuestner^{56, 57} since they bear more directly on the problem I am discussing now, viz., the rôle possibly played by the ovaries in the seeming lowering of sugar tolerance during pregnancy.

Kuestner ascertained that in pregnant rabbits, beginning from the first day after copulation, a glycosuria will be caused by the introduction—through a stomach tube—of a certain amount of glucose which has failed to produce this symptom in the same animal before impregnation. Female rabbits in this respect apparently react exactly

like woman. The cause for this impaired faculty of sugar assimilation could arise only either from the uterus and its contents (fetus and placenta) or from the ovaries. He, therefore, made another series of experiments. He determined exactly the sugar tolerance of each of a number of female rabbits. On the tenth day after impregnation he operated on them. In one-half of the number he removed the uterus and its contents, in the other half he removed only all ovarian tissue. On the second day after operation the castrated animals showed return of their sugar tolerance to normal, while in the hysterectomized animals the lowered tolerance continued up to the fifth day. This proved clearly that the ovaries and not the uterus, fetus or placenta supplied the substance responsible for the lowering of tolerance. He added, however, further evidence for his contention by showing that transplantation of the ovaries removed from the pregnant animals into other nonpregnant rabbits, proved beforehand not to be diabetic, that such a transplantation caused nonpregnant rabbits to react to a glucose intake exactly like pregnant animals. Since he had previously ascertained that this same condition of reduced assimilation power for one dose of sugar can also be demonstrated in seemingly healthy women just before the appearance of the menstrual flow, Kuestner seems justified in his conclusion that the factor which thus disturbs sugar metabolism is supplied by the corpus luteum.

A question naturally suggests itself in this connection. Are these findings of Kuestner that the corpus luteum furnishes the disturbing element not in direct opposition to experiments which tend to show that the removal of all ovarian tissue leads to this same tendency of an alimentary glycosuria? Only seemingly so. A glycosuria follows the injection of extracts of certain endocrines as well as the extirpation of others. Some hormones stimulate, others retard sugar metabolism. The ovary, as already pointed out, unquestionably produces various hormones; they may well be as antagonistic in their influence on carbohydrate metabolism as they apparently are in other respects.

Even with the question of the exact mechanism of ovarian influence still unsettled, Kuestner's work clearly establishes the fact that during pregnancy the ovaries impair the animal's ability to assimilate properly one large dose of sugar.

This reduced ability, expressed in a hyperglycemia and a glycosuria, manifests itself early in pregnancy and also just before the appearance of the menstrual flow, as confirmed by other observers. This fact must be emphasized, because its evidently general disregard by clinicians might well be responsible for serious error in the interpretation of the results of a glucose tolerance test, when made on a woman without proper consideration of the time of her last menstruation.

(c) *Pituitary*.—A physiologic increase in the size of the anterior

lobe of the pituitary during pregnancy has been first mentioned by French and Italian writers and has been later fully confirmed by the thorough histologic studies of Erdheim and Stumme,⁵⁸ and also of Kolde,⁵⁹ who both in animals and the human found a typical, large increase of the chromophobe main cells, which on account of their individual morphologic alteration, in German literature now commonly are spoken of as "pregnancy cells." Enlargements of the hypophysis, up to three times of normal size, have been reported especially in multiparous women. The changes occurring with each succeeding pregnancy are so pronounced that according to Oskar Frankl, the experienced pathologist will be able at necropsy to diagnose the parity of the woman from the size of the pituitary. Exaggeration of this physiologic enlargement occasionally is responsible for a bilateral hemianopsia, the result of pressure against the chiasma. Very recently Loehlein⁶⁰ has recorded the noteworthy observation that in about 80 per cent of all advanced pregnancies a lateral narrowing of the visual field, especially for red and green, can be ascertained. Since the field again is found normal 10 days postpartum, the relation of this alteration of the visual field to pressure exerted by the enlarged hypophysis seems obvious. Certain changes in face and extremities, closely resembling those typical for acromegaly, are not uncommon in pregnancy (Tandler, Gross and Halban). Marek⁶¹ reported a case in which a typical acromegaly developed during pregnancy which completely disappeared after labor.

It is generally conceded (Cushing, Peritz,⁶² Olmstead and Gay⁴⁵) that hyperpituitarism, as a rule, is associated with a distinct lowering of sugar tolerance and this fact in the opinion of many writers allows the deduction (e.g., Dietrich¹³) that the change in sugar tolerance observed during pregnancy may be ascribed to the physiologic hyperactivity of this gland. Wallis⁶³ insists that the blood-sugar curve after a glucose test meal in a pregnant woman is so typical of the curve of the hyperpituitary patient that the hypophyseal origin of the lowered sugar tolerance during pregnancy cannot be doubted. This view is accepted by Williamson⁶⁴ and others. Brown⁶⁵ finds great support for this idea by an observation in which a woman with slight symptoms of acromegaly during pregnancy developed a true diabetes.

We seem thus justified in assuming that the typical morphologic and functional change of the hypophysis observed during pregnancy can leave no doubt that it must influence the carbohydrate metabolism in the sense of a hypophyseal hyperfunction.

(f) *Pancreas*.—In speaking of the pancreas I can limit myself to refer only to certain facts which suggest or prove endocrine functional changes of this gland under the influence of pregnancy.

The etiologic significance of inflammatory or traumatic alterations

of pancreatic tissue in the origin of diabetes mellitus seems generally acknowledged. Allen and his coworkers⁶⁶ state in one of their conclusions: "Clinical diabetes apparently arises regularly on a basis of pancreatitis, either acute or chronic." In a report of Wilder⁶⁷ from the Mayo Clinic the fact is mentioned that out of a total of 298 diabetic patients the presence of an interstitial pancreatitis had been established or strongly suggested in 53 patients.

In a report of two cases of severe glycosuria developing during pregnancy, Henkel⁶⁸ suggested the probability of traumatization of the pancreas by the large uterine tumor, a theory which seems acceptable to Ehret.⁶⁹ A case of definite acute pancreatitis during pregnancy has been described by Haidlen.⁷⁰ In a report of a pancreas necrosis in a pregnant woman, Ellerbrock⁷¹ emphasizes that this particular complication of pregnancy or of the early puerperium seemingly is rare since he could find only 5 other records of this occurrence in literature. He overlooked, however, as I find, e.g., an interesting report by Saenger.⁷² Soon after an easy and spontaneous delivery a seemingly healthy patient died suddenly. Necropsy revealed an entirely unsuspected profuse hemorrhage caused by an extensive necrosis of the pancreas. Quite recently a similar observation has been recorded by Matthaei.⁷³ In an extensive paper dealing with apoplexy of the pancreas after labor, Plumper⁷⁴ quotes a few more cases from literature and describes in detail a case seen by him. He is, however, not inclined to believe that this necrosis necessarily stands in an immediate etiologic relation to pregnancy and labor. In a general discussion of the relations of the pancreas to genital function and diseases in the female, Prochownik⁷⁵ expressed the belief that severe indigestion symptoms and especially epigastric pain in pregnant women, usually ascribed to the gall bladder, might have been caused by temporary pancreas disease if not later found actually to be due to the gall bladder.

Observations of morphologic changes of the Langerhans islands under the influence of changed ovarian function and of pregnancy have been described by Italian authors. Rebaudi⁷⁶ found that in rabbits, guinea pigs and dogs the islands become hypertrophic and seemingly hyperactive after castration and even after removal of only the corpus luteum tissue.

Sirtori⁷⁷ described progressive changes of a degenerative nature during pregnancy, in his opinion indicating a gradually increasing hypofunction. Just the opposite, indications of hyperactivity of the islands during pregnancy, are found by Pepere, and later were confirmed by Ciulla.⁷⁸ While, on the other hand, Falco's investigations⁷⁹ on pregnant dogs convinced him that there are definite histologic signs of diminished activity. Thus we might conclude, that probably characteristic and physiologic morphologic changes do not occur in

the Langerhans islands during pregnancy. Obviously this does not exclude the possibility of either degenerative alterations under certain conditions, or of individual variations in the amount of islands tissue as the result of hereditary influence or of anomalies in development.

Of still undetermined significance in the problem here discussed is the following noteworthy fact: Cantoni⁸⁰ studied by means of the Gross-Einhorn method the external pancreatic secretions of 21 patients in various stages of pregnancy and the puerperium. He found during pregnancy, as compared with the puerperium, the proteolytic ferment diminished, the lipolytic ferment more diminished than the proteolytic, while the amylolytic ferment apparently had remained practically unchanged. Investigating the external pancreatic secretion in diabetic patients, Jones⁸¹ discovered in 50 per cent a proteolytic activity below the minimum normal level, being in 30 per cent far below the minimum. The lipolytic activity also in 50 per cent was below the lowest normal figures, while only 10 per cent revealed a marked lowering of amylolytic ability.

The similarity of the results obtained by these two investigators is at least suggestive of alterations in pancreatic function during pregnancy resembling those of true diabetics.

A question of great importance in regard to endocrine pancreatic function during pregnancy has been opened by Carlson.⁸² Can the fetal pancreas act vicariously for an underfunctionating maternal pancreas? Carlson found that a pancreatectomized dog will not develop the usual hyperglycemia and glycosuria when at the time of operation she is in an advanced stage of pregnancy, but that these sequelae of pancreatectomy will become manifest immediately after the intra-uterine death, or after expulsion, of the fetuses.⁸³ This fact has been confirmed by Lafon⁸⁴ and also by Falco.⁷⁹ Allen⁸⁵ ascribes this failure of a glycosuria to appear to the pronounced cachexia of the operated animal. Carlson and Lafon admit that there are two possibilities which might explain the phenomenon, either that fetal pancreatic hormones are transmitted to the mother animal, or that the fetuses, without any embarrassment to their own carbohydrate metabolism, are able to dispose of the excess of maternal blood sugar by oxidation or storage. Falco advances still another explanation. The surplus of maternal blood sugar is metabolized by placental ferments entering the maternal blood. I shall have occasion later to show that this explanation is not in accord with newer information concerning placental function. Though not explained, the fact remains that this seemingly beneficial effect of pregnancy on a diabetes, artificially produced by the removal of the pancreas, sharply contrasts with the common clinical experience of the usually harmful effect of pregnancy on a diabetic woman. This discrepancy, however, is very likely due to a fact, merely suggested by Carlson,⁸⁶ namely that the

diabetes produced in an animal by extirpation of the pancreas possibly represents an entirely different type than that observed in the human. In my belief this idea of Carlson of an essential difference certainly might hold true for the pregnant woman, since in her the appearance of diabetic symptoms and also the aggravation of an existing diabetes, to a large extent, is dependent upon marked functional changes in other endocrines outside of the pancreas.

Carlson's observations on pregnant depancreated dogs bring up still other questions which are of considerable importance in considering a possible harmful effect of insulin, administered to a pregnant woman, on the fetus *in utero*, in case of its passage through the placenta. Carlson assumes that the fetal pancreas has a normal endocrine function. There exists in literature a unique observation of Dubreuil and Anderodias⁸⁷ which throws some light on this particular problem. At the end of the eighth month of her fourth pregnancy a diabetic woman expelled a live infant weighing 5000 grams in spite of its evident prematurity. At autopsy it was found that this child's pancreas contained, using the authors' own term, "gigantic" compact masses of islands tissue. In some of the microscopic fields this tissue occupied one quarter of the space. They think that a persistent passage of blood sugar from the hyperglycemic mother to the fetus accounts not only for his large size, but also directly led to the enormous formation of islands tissue. "It developed for the protection of the child against a hyperglycemia," and thus, they conclude, these findings prove normal endocrine pancreatic function in the fetus. This view is supported by the observation of Aron⁸⁸ that the glycogenic activity of the fetal liver evidently begins with the first appearance of islands tissue in his pancreas.

Since many writers and many textbooks of obstetrics rather definitely speak of deficient pancreatic function of the newborn as the result of the mother's diabetes, it becomes necessary to consider in this connection the question of hyperglycemia and glycosuria of the newborn.

Schauta⁸⁹ thought that such fetuses so often are stillborn, because they have succumbed to a disease "analogous to that of the mother." Wolff⁹⁰ asserts that 10 per cent of living babies born by diabetic mothers die from diabetes within the first year of life. He thinks that a disturbed carbohydrate metabolism during intrauterine life in these infants is proved by an enormous accumulation of glycogen in all their organs, ascertained by him in two cases. Outside of one case of temporary glycosuria appearing in a baby 18 days old, reported by Chambrelent,⁹¹ I have failed to find any confirmation for such views in a careful search through obstetric and pediatric literature. In 1890, Stern⁹² published a list of 117 cases of diabetes in children so far recorded in literature. Among these were but 6 instances of infants

less than a year old. Among these six there is but one case of a newborn, showing a glycosuria at birth, and this particular case, as a matter of fact, has been reported in the year 1852. These six cases, cited by Stern, I suppose have reappeared in many of the later surveys. There is another collection of such cases extant, prepared by Wegeli⁹³ including 108 other observations of diabetes in infancy. Among them there are only three children less than one year old, the youngest being three months old. In the data on all these 108 cases only in two the fact is mentioned that the mother also was a diabetic. Kochmann,⁹⁴ in 1922, emphasizes that diabetes within the first year of life undeniably is extremely rare and that all the earlier reports should be disregarded because in them the diagnosis of diabetes obviously was based solely on the presence of some reducing substance in the urine.

A traumatic glycosuria of the newborn has been described by Hoeniger,⁹⁵ supposedly the effect of a cerebral traumatism after forceps extractions. In control observations, made by Lindig,⁹⁶ however, but three of 27 newborns extracted with forceps showed a slight glycosuria of very short duration.

A blood-sugar determination on newborn infants for obvious reasons was possible only for the past few years. Cannata,⁹⁷ Sedgwick and Ziegler,⁹⁸ Guy⁹⁹ and others agree that the fasting values are approximately normal, slightly below the normal average of adults. More directly connected with the question under discussion are rather uniform findings, e.g., by Morriss¹⁰⁰ or Rowley¹⁰¹ that a comparison of maternal and fetal bloods, both obtained simultaneously in the moment of birth, shows almost invariably a slightly higher blood-sugar concentration of the maternal blood. This observation is still another valid argument against the theory that the passage of the maternal sugar to the fetus is determined by the action of a glycolytic ferment in the placenta, and thus, as already mentioned, weakens further the theory of Falco⁷⁹ that placental ferments, passing into the maternal blood, might prevent a hyperglycemia of the mother. It also has been shown that a physiologic hyperglycemia during labor, especially when anesthetics are employed (Frey,¹⁰² Rowley,¹⁰¹ Walthard¹⁰³) or in eclamptics (Widen¹⁰⁴) does not raise the fetal blood-sugar above its normal limits, but only accentuates the existing difference in favor of the maternal blood.

Summarizing available information concerning fetal and maternal pancreatic function during pregnancy we can say: We possess no definite evidence of a physiologically altered function in the mother. We have evidence that the pancreas of the fetus functionates normally, but not the slightest proof for the transition of islands hormones from the fetus to the mother, or *vice versa*. We may assume that in accord with the law of diffusion in a diabetic mother a larger amount of sugar

is passed through the placenta to the fetus, but it seems that the latter is able to metabolize properly this excess, a fact which may explain the common observation that babies of diabetic mothers are very heavy. A baby born by a diabetic mother, however, is not likely to show a glycosuria or other signs of diabetes at birth.

VEGETATIVE NERVOUS SYSTEM

In view of the acknowledged intimate relation of the vegetative nervous system to the endocrine system, it is difficult to deal with the former in a separate chapter. There are, however, certain facts, intimately connected with changes of the nervous system during pregnancy that can be grouped together more conveniently in this manner.

Is the sympathetic nervous system during pregnancy in a state of increased irritability? Aschner¹⁰⁵ answers this question with yes. Motzfeld¹⁰⁶ more cautiously says that for the present we must be content with the vague idea of an increased sympathicotonus. Bauer⁵⁰ admits the difficulty of making any statement concerning the state of the entire system, because only certain of its parts or only certain of its functions can be studied by means of pharmacodynamic tests or physical examinations. As far as the specific problem under discussion is concerned, we can say that the sympathetic stimulates thyroid, adrenals and hypophysis and that, as shown in preceding pages, these glands, all active in the mobilization of sugar into the blood, during pregnancy are in a state of more or less marked hyperfunction.

Of greater importance in our problem, however, is the probable existence in the central nervous system of a center controlling or regulating carbohydrate metabolism. Some physiologists and most clinicians believe in its existence. I will only mention the classic *piqure* experiment of Claude Bernard and the variously confirmed observation of Aschner¹⁰⁵ that also injury of the hypothalamus causes hyperglycemia and glycosuria persisting up to the death of the animal. A most noteworthy addition to available information concerning the existence of such a center, very recently, has been supplied by Dresel and Lewy.¹⁰⁷ They found in every case of diabetes mellitus, at post-mortem, pronounced degenerative changes in the globus pallidus of the corpus striatum. In their belief these findings prove that here is located a center which regulates the blood-sugar level, by controlling stimulations sent to both the sympathetic and parasympathetic cells of the vegetative nucleus in the oblongata. Their effect is antagonistic and thus counterbalances glycogenesis and glycogenolysis.

MAINTENANCE OF BLOOD-SUGAR CONCENTRATION

All authorities agree that in healthy pregnant women blood-sugar concentration varies within normal limits (Bentlin,¹⁰⁸ Bergsma,¹⁰⁹ Boutot, Clogue and Lantuejoul,¹¹⁰ Guggisberg,¹¹¹ Morriss,¹⁰⁰ Rowley,¹⁰¹

Ryser,¹¹² Schiller,¹¹³ Walthard¹⁰³). We must conclude from this fact that the automatic mechanism maintaining blood-sugar concentration proves fully competent also in pregnancy—in spite of the acceleration of sugar mobilization as the result of certain endocrine changes. This seeming preservation of the equilibrium between glycogenesis and glycogenolysis cannot be explained on the basis of a physiologic impairment of islands function, as I have shown in speaking of the pancreas. Any acceptable explanation will necessarily have to take into account also the evident liability of the pregnant woman to develop a glycosuria at a blood-sugar level within normal limits. In view of these facts it seems reasonable to think of changes in the behavior of the renal threshold for sugar under the influence of pregnancy. Might it be that during pregnancy some of the sugar, quickly passed into the blood, is permitted to flow promptly into the urine by the automatic lowering of the threshold?

RENAL THRESHOLD FOR SUGAR

Space will not permit to enter here into an adequate discussion of the complex and not yet fully understood problem of the renal threshold for sugar. However, the following facts can be accepted as firmly established: Not every increase of blood-sugar concentration above the usual and normal level causes a glycosuria. In a nondiabetic individual the blood sugar, as a rule, may rise to 0.17 per cent before glucose in appreciable amounts can be found in the urine. This degree of blood-sugar concentration, therefore, rather generally has been accepted as the normal renal threshold. This threshold is not only raised or lowered by certain pathologic conditions, but varies considerably in different seemingly healthy individuals, and changes, under certain influences, also in the same individual.

Medical literature often rather definitely speaks of a lowered or increased ability of the kidney to act as a filter for sugar though physiologists still are uncertain whether a certain glycosuria is due to an actual alteration in the permeability of the glomeruli for sugar, or possibly is simply the expression of retardation or acceleration of the blood stream as the result of contraction or dilatation, respectively, of renal capillaries, and whether under other conditions some or all of the urinary sugar might not represent sugar normally stored in the renal tissues in the form of glycogen. I, therefore, wish to emphasize that in the following the admittedly inaccurate terms renal threshold and renal filter are employed merely to express in a general way the relation between the appearance of a glycosuria and the sugar concentration of the blood at that moment.

We are acquainted with the fact that the renal threshold of an individual is not stable and that it is markedly lowered almost instantaneously, under the influence of a sudden emotion or by the injection

of certain organ extracts (e.g., adrenalin) or of drugs (e.g., phlorizin). In spite of a blood-sugar concentration below 0.17 sugar suddenly appears in the urine. Believing in the existence of an automatic mechanism which maintains the equilibrium between the two antagonistic functions of glycogenesis and glycogenolysis I consider it entirely plausible that also the variable renal threshold stands under the control of this regulating center. In view of the evident acceleration of the sugar utilization process during pregnancy as the result of the simultaneous hyperactivity of several endocrines, a prompt automatic lowering of the threshold undeniably would represent an ideal means of avoiding an abnormal rise of the blood-sugar contents after the intake of one large dose of carbohydrate. It is a fact that just under this condition the lowering of the threshold manifests itself during pregnancy, and therefore I feel justified in concluding that the striking lability of the renal threshold of the pregnant woman, utilized in the various diagnostic tests and evidenced in the not uncommon post-prandial glycosuria, really represents a protective measure against a hyperglycemia which otherwise would seem inevitable in view of the existing stimulation both of sugar assimilation and of glycogenolysis.

VARIOUS TYPES OF GLYCOSURIA

The problem of the physiologic lowering of the renal threshold has become one of great interest and practical importance to the obstetrician. In obstetric literature, as already mentioned, today it is spoken of as renal diabetes or alimentary glycosuria. In my belief both terms are incorrectly applied to the phenomenon.

Renal Diabetes, as understood by clinicians, is a condition of abnormally increased renal permeability for sugar, existing as a chronic condition in otherwise healthy individuals. In this disease, in spite of a blood-sugar concentration at or even below the normal level, a moderate degree of glycosuria persists rather independent from the carbohydrate intake. Clinicians insist that the diagnosis of renal diabetes is determined by the definite exclusion of any toxic condition and of any anomaly in the nervous or endocrine systems which might account for a glycosuria. It seems rather obvious that conditions are essentially different in the pregnant woman. She represents an individual in whom hypophysis, adrenals and thyroid most probably are in a state of hyperactivity, who often even early in pregnancy exhibits the signs of toxicosis, who is subject to emotions, and very often shows evidences of other disturbances in the function of nervous and endocrine systems. She manifests a glycosuria, not as a persistent symptom, but only after the injection of minimal doses of adrenalin or phlorizin and especially after the ingestion of one larger dose of glucose, levulose or even only of starch. The pregnant woman, as I see it, has with the patient suffering from a renal diabetes

nothing in common except that in both of them sugar flows into the urine with a blood-sugar concentration below the level of 0.17. But also in this respect a difference exists, which I consider to be most significant: In renal diabetes the low threshold is a fairly permanent condition, in the pregnant woman it becomes evident solely under the influence of certain procedures.

Alimentary Glycosuria, in the view of the clinician, indicates a definite weakness within the mechanism of carbohydrate utilization of the individual.

These patients are barely able to metabolize properly the usual amount of carbohydrate taken within 24 hours in the average mixed diet, but fail to assimilate a larger amount. Postprandial hyperglycemia is marked and likely to be associated with a brief glycosuria. In contradistinction to renal diabetes, in them the glycosuria is definitely dependent upon the sugar intake. From this point of view an objection must be raised against the custom of employing in obstetric literature the terms renal diabetes and alimentary glycosuria as synonyms. The clinician makes a strenuous though at times vain effort to keep these two types of glycosuria strictly apart.

Comparing the glycosuria of the pregnant woman, manifesting itself after one large dose of sugar, with alimentary glycosuria, in its clinical meaning, we also can discover noteworthy differences. In a case of clinical alimentary glycosuria there exists a general inability to metabolize food carbohydrates taken in amounts well within the very wide limits of variation allowed by a normal carbohydrate metabolism. Naturally this *general lowering of sugar tolerance* will manifest itself when a glucose test meal is given, also in a reduction of the *immediate assimilation power*. It is incorrect and unjustifiable, however, to speak of a general lowered sugar tolerance in pregnancy because, as a matter of fact, the pregnant woman is physiologically forced to increase the total food and with it the carbohydrate intake in order to supply the needs of the fetus. This increase of the carbohydrate intake, however, does not cause by itself a glycosuria. The pregnant woman shows a weakness in her sugar metabolism *only* in a distinct lowering of her ability to assimilate properly one large dose of carbohydrates, glucose, levulose or even starch. This represents, in my opinion, so essential a difference from clinical alimentary glycosuria that it cannot be disregarded. It is this fact which induces me to assume that the postprandial glycosuria of the pregnant woman cannot be due to the same causes presumably at work in the case of a clinical alimentary glycosuria, but that it seems more reasonably ascribed to a prompt lowering of the renal threshold, required during pregnancy as a protective measure in the face of greatly accelerated sugar mobilization.

The demand for a greater amount of carbohydrate during preg-

nancy and the speeding up of its metabolism is fully in accord with our present biologic conception of a specific constitutional endowment of woman for the purpose of reproduction. It is significant that these radical changes in the sugar utilization process together with certain manifestations of its anomalous function, as a rule, cease promptly with the termination of pregnancy. The various diagnostic tests, enumerated above, fail to produce a glycosuria as soon as the state of pregnancy has been terminated by the expulsion or the death of the fetus.

DIABETES

In some instances, however, a permanent disturbance of the carbohydrate metabolism in form of a true diabetes can be observed. In part at least such an unexpected development must be ascribed to our present inability of diagnosing with certainty, or differentiating in every case between a renal diabetes, an alimentary glycosuria and a diabetes mellitus, the three types of glycosuria presumably representing definite pathologic entities. With increasing frequency instances are reported in which patients, seemingly suffering from a harmless form of glycosuria, or apparently only from a diabetes insipidus, finally prove to be true diabetics. As obstetricians we naturally must be interested in the question whether pregnancy might be responsible for the development of diabetes mellitus.

Simply from a clinical point of view the possibility must be admitted. With more justification than ever before we can speak today of a constitutional disposition, inherited or acquired, which under the influence of an added factor as immediate cause will lead to diabetes. Excessive intake of carbohydrate, toxic conditions and alterations of endocrine function are generally accepted as the most common of such provocative factors. All three of them, singly or in combination, are present in the majority of pregnant women. By themselves, however, they are unable to produce the disease. Diabetes mellitus, according to our present conception, presupposes impaired pancreatic function.

Impaired pancreatic function antedating impregnation, therefore, is likely to become more marked during pregnancy. A preexisting diabetes, as we know, usually shows marked progression under the influence of pregnancy. But also a glycosuria, seemingly only of the alimentary type, might develop into a true diabetes as the result of further deterioration of endocrine pancreatic function. Cases of diabetes manifesting themselves first in the course of pregnancy are on record, and I am able to add another observation of this occurrence.

We know that a relative functional insufficiency in various organs of the pregnant woman (kidney, liver) at times, gradually and insidiously, will turn into a definite and permanent pathologic lesion, i.e.,

into actual disease. In my opinion, these gradual functional and morphologic changes in the course of gestation represent a fruitful, and not sufficiently explored field for the search of the origin of certain diseases, and for the study of predisease states, if I may use this term in analogy to that now much employed word, preeclamptic state. A careful analysis of the alterations during pregnancy in the process of carbohydrate metabolism certainly throws light on the problem of the origin of diabetes. The pregnant woman not infrequently offers occasion for realization of the fact that no sharp line can be drawn between alimentary glycosuria and diabetes; she also offers valuable opportunity for exact observation of the very first manifestations of a true diabetes. I shall point this out more conveniently by describing and discussing a routine procedure for the study and management of the glycosuric pregnant patient, which I have adopted in my own work.

While taking the patient's first history an effort should be made to obtain definite or suggestive information concerning a previous glycosuria.

If in the course of prenatal care, with urinalysis made every three weeks earlier and every two weeks later in pregnancy, sugar is discovered in the urine, the patient is asked whether she has taken an unusually large amount of sugar within the past 24 hours, probably in form of candy. In my experience an affirmative answer most likely will be given. The patient is asked to refrain from candy, very sweet pastry, etc., for the next 48 hours but without other marked change in her usual diet. At the next test, as a rule, the urine will be found free of sugar. This patient is then told to avoid using sugar in excessive amounts.

If sugar is found also at the second examination, the urine is reserved for a fermentation test to determine whether it contains glucose, and the patient is instructed to reduce her sugar intake to a minimum. No other restriction of carbohydrates is demanded. In case the fermentation test shows glucose, the fasting blood-sugar concentration is determined immediately. If the blood-sugar is found well within physiologic limits, i.e., below 0.1 per cent, a carefully arranged diet is likely to keep the patient aglycosuric. If even under faithful observance of this restricted diet occasionally sugar appears in the urine, another blood-sugar determination is combined with a sugar assimilation test and her blood-sugar curve obtained. A warning must here be added.

The fact is well known that but one large load of glucose may start a long continued glycosuria (Kawaichi⁵⁰) or change a so-called potential diabetic patient into a true diabetic (Gray¹¹⁴). Therefore it is reprehensible to give to a woman 100 or 200 grams of glucose solely as an aid in the diagnosis of pregnancy without a preliminary deter-

mination of her fasting blood-sugar. The absence of sugar in her urine can be misleading since long-continued hyperglycemia often leads to a considerable rise of the renal threshold so that even a true diabetic at times is found aglycosuric.

A test for the assimilation power of sugar in a pregnant woman, therefore, must always be made with special care, beginning with relatively small loads. The blood-sugar curve might place the patient definitely into the group of diabetics or definitely exclude her from it. In many instances, however, the obtained sugar curve, I think as a result of the existing disturbance in endocrine function, will at least suggest the plateau type or will transgress the physiologic upper level, so that it will be impossible to diagnose from the curve with exactness the character of the disturbance of the carbohydrate metabolism. We are told by Gray¹¹⁴ that every clinician is faced with this dilemma, the obstetrician it seems unfortunately more often. These cases belong into that indefinite group of potential or suspected diabetes and, to their advantage, are best handled as diabetics, especially when pregnant, since in them notoriously harmful influences will continue to exert their deleterious effect up to the termination of pregnancy. All these patients, therefore, should be treated and managed like true diabetics.

TREATMENT OF DIABETES DURING PREGNANCY

Severe and long-continued diabetes almost regularly leads to amenorrhea and sterility. For this reason the obstetrician usually will deal only with comparatively light cases or those truly in the incipient stage.

The essential part of the treatment of diabetes still consists in the regulation of diet. There is, however, one point which requires due consideration in the dietetic treatment of a pregnant woman. Her caloric needs in general, and her carbohydrate needs in particular, are markedly increased. Pregnant women tolerate badly any rapid or marked reduction of the carbohydrate intake. Harding and Potter¹¹⁵ very recently, in a very thorough study of the effects of starvation, brought out the important fact that in pregnancy the disturbances caused by a lack of carbohydrates are more intense than in starvation. Motzfeld¹⁰⁶ asserts that a ketonuria is often seen in pregnant women even after only a moderate restriction in the carbohydrates. Indeed, Pritzi and Lichtmann¹¹⁶ consider this acetoneuria frequent enough to be of some value in the diagnosis of pregnancy, since they saw it follow carbohydrate restriction in 39 out of 44 pregnant women tested in this manner. Personally I have no doubt that the frequency with which death in coma is recorded in these cases in obstetric literature is to a large extent due to hasty restriction of

the carbohydrates when a large amount of sugar suddenly is discovered in a pregnant woman.

If dietetic measures fail to bring the blood-sugar near a normal level and the glycosuria continues, without fear or hesitation, insulin should be administered. When resorting to insulin for the first time I was not free of fear. At that time no case of insulin treatment of a pregnant woman had been recorded in literature. I was, for example, greatly disturbed by the thought that insulin might pass to the fetus as other substances undoubtedly do. My apprehension in this and many other respects has been completely dissipated by careful search for all available information. The conclusions drawn from these studies I have presented in part in the preceding pages.

Very briefly I shall quote but a few interesting data concerning the case which started my interest in this problem.

In the course of routine prenatal care a marked glycosuria was discovered, about three weeks after the preceding negative urinalysis, in a heretofore very healthy, young primigravida, six months' pregnant. She had recently noticed increased thirst but always had been a hearty eater. Further examination showed a glucose output of 66 grams in 24 hours and a fasting blood sugar of 0.26. All efforts to reduce the blood sugar or to eliminate the glycosuria by diet failed. After careful consideration a trial with insulin was decided on. With gradually increasing doses the patient was finally rendered and kept aglycosuric for the rest of her pregnancy with 40 units of insulin per day, given in three injections, together with a diet consisting of 120 grams of carbohydrates, 50 grams of protein and 200 grams of fat, representing 2480 calories. The blood sugar fluctuated between 0.107 and 0.131. She was perfectly comfortable, and exactly at the expected time she passed through an uneventful labor, being delivered of a living child weighing 3410 grams. In the moment of birth blood was simultaneously obtained from the mother and the umbilical cord. Maternal blood showed a sugar concentration of 0.144, the infant's blood of 0.140, thus representing the seemingly characteristic difference, already mentioned, and the maternal blood showing a slightly higher concentration than at any time since insulin was used, proving the physiologic rise during labor. Immediately after labor, as a precaution, insulin was reduced to 20 units. Maternal blood-sugar on the second day postpartum was 0.103. When after an injection of 10 units on the second day the patient reacted with the typical symptoms of a hypoglycemia, all insulin was stopped. With gradual return to her previous diet of 2480 calories and without insulin the patient remained aglycosuric, the blood sugar having fallen to 0.08 on the sixth day postpartum. The baby was at birth, and remained, aglycosuric and developed normally. The amniotic fluid, normal in amount, did not contain sugar.

For the next several months, not keeping exactly to her diet, the patient was well in every respect. She was not nursing her baby because I thought it unwise to risk the otherwise necessary increase of food. My medical consultants felt not ready to agree with my own diagnosis of diabetes mellitus. The prompt and seemingly complete recovery immediately after labor appeared suspicious. They preferred to term it a case of acute pancreatic insufficiency during pregnancy. Unfortunately the fact is now fully confirmed that this is a

ease of diabetes mellitus first appearing during pregnancy. Recently this patient was attacked by a polyarticular rheumatism which caused all the characteristic signs of diabetes to reappear.

It is my belief that insulin will reduce practically to nothing the admittedly grave dangers of a complication of pregnancy with diabetes, both as far as mother and infant are concerned. In the light of our new conception of diabetes obviously all older statistics have become unreliable. They date, without exceptions, back to the time when a marked glycosuria meant diabetes and the absence of sugar from the urine definitely excluded this disease. In general, however, these statistics, furnished, e.g., by Coloni,¹¹⁷ Cron,¹¹⁸ Fruhinsolz,¹¹⁹ Geelmuyden,¹²⁰ Offergeld,¹²¹ Reinhardt,¹²² Umber,¹²³ Williams,¹²⁴ demonstrate the fact that in this complication of pregnancy great danger arises to the mother from the rapid progress of her disease, from the likelihood of an operative procedure of some sort required for termination of the pregnancy or during delivery, from her general unfitness to stand an operation or a general anesthesia, and from the increased danger of a septic infection. Diabetes greatly raises fetal mortality through the probability of intrauterine death, of premature labor, spontaneous or induced, and through complications of labor caused by hydramnion or the abnormal size of the child. I deliberately omit the one more risk mentioned in most textbooks, namely, the probability of the infant's being diabetic at birth.

It will take many more years before an adequate number of pregnant women will have been treated with insulin to permit a statistical study of results, but I think that our present knowledge of insulin effect is sufficient to justify the following conclusions or prophecies. The progress of the disease will be greatly retarded if not actually checked. Among all physicians the obstetrician has the best opportunity to discover, in the course of routine prenatal care, diabetes in its earliest stages. There is some evidence existing that insulin actually has a curative effect in early or mild cases (Horder,¹²⁵ Leyton,¹²⁶ etc.). Therefore, the obstetrician might be able even to prevent the development of a true diabetes in some of his glycosuric pregnant patients by paying proper attention also to blood-sugar changes. Since the obstetrician comparatively rarely has to manage a chronic diabetic patient, he will usually be able to maintain his potentially or actively diabetic patients, for the rest of their pregnancy, in a state not different from the healthy woman as far as her relation to the fetus *in utero* is concerned. There is likelihood that under insulin treatment the amniotic fluid would be normal in amount, and the fetus of normal size. These two facts eliminate for the fetus the dangers incident to abnormal labor and operative delivery. There should but rarely, if ever, arise the necessity for interruption of pregnancy. If an operation should become necessary, the mother would prove a

normal operative risk. There then solely remains the problem of increased susceptibility to septic infection. Authorities still disagree as regards the cause of the evident frequency of wound infection and disturbed wound healing in the diabetic patient. Some believe it to be due to the sugar in the tissues while others ascribe it to vessel changes. Both probably are right, but the obstetrician fortunately is not concerned with this disagreement. Vessel changes presumably exist only in the chronic cases, the type which the obstetrician but rarely sees. His patients under insulin treatment will have only a normal amount of sugar in the tissues.

To speak concerning the seeming value of insulin given simultaneously with intravenous introduction of glucose in the treatment of pernicious vomiting or of other types of acidosis with which the obstetrician has to deal (Thalhimer¹²⁷) falls outside the scope of this paper and, therefore, in closing I shall limit myself to the assertion that in every textbook of obstetrics the chapter dealing with the complications caused in pregnancy by severe glycosuria or diabetes requires immediate and thorough revision.

Briefly summarized, the views presented in this paper are as follows:

In marked difference to man, woman is basically equipped to bear children. This specific constitutional endowment necessarily causes definite functional changes in various organs outside her genitalia during the various phases of her generative activity, changes, for obvious reasons, most pronounced during pregnancy.

The changes are expressed not only in the functional alterations of single organs but also of coördinate organ function, e.g., in the entire endocrine system. Changes in those endocrines, admittedly of importance in the carbohydrate metabolism, during pregnancy uniformly are of a nature to indicate that they are hyperactive in the sense of sugar assimilation. This is entirely in accord with the necessity of increased carbohydrate intake for the needs of the fetus. In spite of increased and accelerated sugar assimilation during pregnancy, blood-sugar concentration as a rule remains within the normal limits.

The automatic mechanism, which maintains the blood-sugar level under the antagonistic effects of glycogenesis and glycogenolysis, during pregnancy proves adequate. Seemingly this is accomplished by making readier use of another available means of preventing a hyperglycemia, namely, by a prompt lowering of the renal threshold. An outlet thus is offered for the escape of some of the sugar which is passed quickly into the blood of the pregnant woman through the evident speeding up of the carbohydrate assimilation process. This prompt lowering of the renal threshold as a protective measure in pregnancy is expressed in the decidedly common appearance of a glycosuria after the intake of glucose, levulose or even starch in

amounts which in the nonpregnant healthy woman fail to provoke this phenomenon.

This artificial glycosuria, often seen very early in pregnancy, and for this reason employed as an aid in diagnosis, in itself is neither a renal diabetes nor an alimentary glycosuria in the usual clinical meaning of these terms.

Diabetes is a disease dependent upon insufficiency of endocrine pancreatic activity. In women, in whom pancreatic function before impregnation is only barely sufficient or already slightly deficient, the necessity of increased carbohydrate intake, toxic conditions and alterations in endocrine function, during pregnancy may lead to a true diabetes mellitus. It seems probable that insulin will practically eliminate all the many known grave dangers, to mother and child, arising through a complication of pregnancy with diabetes.

BIBLIOGRAPHY

- (1) Muenchen. med. Wehnschr., 1920, lxvii, 1433. (2) Therapie d. Gegw., 1921, lxii, 321. (3) Inaug. Dissert. Breslau, 1922. (4) Ztschr. f. Geb. u. Gynäk., 1913, lxxiv, 586. (5) Klin. Wehnschr., 1922, i, 220. (6) Klin. Wehnschr., 1922, i, 1747. (7) Deutsch. med. Wehnschr., 1922, xlviii, 1340. (8) Klin. Wehnschr., 1922, i, 2084. (9) Zentralbl. f. Gynäk., 1922, xlv, 348. (10) Zentralbl. f. Gynäk., 1922, xlv, 1413. (11) Zentralbl. f. Gynäk., 1922, xlv, 851. (12) Physiology and Biochemistry in Modern Medicine, C. V. Mosby Co., St. Louis, 1922. (13) Klin. Wehnschr., 1922, i, 1403. (14) Ztschr. f. klin. Med., 1913, lxxviii, 413. (15) Deutsch. med. Wehnschr., 1921, xlvii, 1124. (16) Klin. Wehnschr., 1923, ii, 880. (17) Acta Gynaec. Scandiu. 1923, ii, 345. (18) Muenchen. med. Wehnschr., 1922, lxix, 6. (19) Acta Gynaec., Scandiu., 1923, ii, 138. (20) New York Med. Jour., 1923, cxviii, 543. (21) Klin. Wehnschr., 1922, i, 1152. (22) AM. JOUR. OBST. AND GYNEC., 1923, v, 369. (23) AM. JOUR. OBST. AND GYNEC., 1923, v, 33. (24) Zentralbl. f. Gynäk., 1923, xlvii, 260. (25) Bull. de la Soc. d'Obst., Paris, 1922, p. 435. (26) Deutsch. med. Wehnschr., 1923, xlix, 182. (27) Deutsch. med. Wehnschr., 1923, xlix, 117. (28) Deutsch. med. Wehnschr., 1923, xlix, 1468. (29) Monatschr. f. Geb. u. Gynäk., 1923, lxiii, 69. (30) Klin. Wehnschr., 1922, i, 889. (31) Cal. State Jour. Med., 1922, xx, 344. (32) Monatschr. f. Geb. u. Gynäk., 1921, lvi, 283. (33) Ztschr. f. ges. exp. Med., 1922, xxvi, 34. (34) Klin. Wehnschr., 1922, i, 2467. (35) Klin. Wehnschr., 1922, i, 1204. (36) Zentralbl. f. Gynäk., 1922, xlv, 1883. (37) Vignes, Physiologie Obstetricale, Masson et Cie, Paris, 1923. (38) Presse Medicale, 1921, xxix, 473. (39) AM. JOUR. OBST. AND GYNEC., 1922, iv, 26. (40) Jour. Am. Med. Assn., 1923, lxxx, 743. (41) Jour. Obst. and Gynec., Brit. Emp., 1922, xxix, 21. (42) Arch. f. Gynäk., 1917, cvii, 209. (43) Arch. Int. Med., 1922, xxix, 384. (44) Am. Jour. Chem., 1914, xviii, 87. (45) Mitt. a. d. Grenzgeb. d. Med. u. Chir., 1906, p. 632. (46) Zeitschr. f. Geb. u. Gynäk., 1905, lxii, 194. (47) Rev. franc. de gyn. e. obst., 1923, xviii, 697. (48) Konstitutionelle Disposition zu inneren Krankheiten, Julius Springer, Berlin, 1921. (49) Zentralbl. f. Gynäk., 1923, xlvii, 1043. (50) Monatschr. f. Geb. u. Gynäk., 1921, liv, 215. (51) Zentralbl. f. Gynäk., 1919, xlvi, 561. (52) Gyn. Rundschau, 1912, vi, 898. (53) Gyn. Rundschau, 1913, vii, 93. (54) Zentralbl. f. Gynäk., 1922, xlv, 1238. (55) Monatschr. f. Geb. u. Gynäk., 1923, lxii, 119. (56) Ziegler's Beitr., 1909, xlv, 1. (57) Arch. f. Gynäk., 1912, xcviii, 505. (58) Monatschr. f. Geb. u. Gynäk., 1924, lxx, 1. (59) Zentralbl. f. Gynäk., 1911, xxxv, 1612. (60) Einfuehrung in die Klinik der inneren Sekretion, S. Karger, Berlin, 1923. (61) Jour. Obst. and Gynec., Brit. Emp., 1922, xxix, 274. (62) Clinical Jour., (London), 1922, li, 541. (63) Lancet, 1924, cccv, i, 59. (64) Rockefeller Institute, 1919, Monogr. No. 11. (65) Med. Clinics North America, 1921, v, 455. (66) Deutsch. med. Wehnschr., 1909, xxxv, 2003. (67) Muenchen. med. Wehnschr., 1911, lviii, 897. (68) Zentralbl. f. Gynäk., 1884, viii, 609. (69) Monatschr. f. Geb. u. Gynäk., 1922, lviii, 13. (70) Muenchen. med. Wehnschr., 1913, lx, 1321. (71) Zentralbl. f. Gynäk., 1923, xlvii, 1223. (72) Ned. Tijdschr. v. Geneesk., 1923, i, 1655. (73) Monatschr. f. Geb. u.

Gynäk., 1915, xlii, 241. (76) Zentralbl. f. Gynäk., 1908, xxxii, 1332. (77) Annali di Ost. e Gin., 1907, i, 433. (78) Ginec. moderna, 1911, iv, 237. (79) Annali di Ost. e Gin., 1916, xxxviii, 1. (80) Folia gynaec., 1921, xiv, 3. (81) Boston Med. and Surg. Jour., 1923, clxxxix, 851. (82) Am. Jour. Physiol., 1911, xxviii, 391. (83) Am. Jour. Physiol., 1915, xxxvi, 217. (84) Compt. rend. Soc. de Biol., Paris, 1913, lxxv, 266. (85) Am. Jour. Physiol., 1920-21, liv, 451. (86) Jour. Biol. Chem., 1914, xvii, 19. (87) Compt. rend. Soc. de Biol., Paris, 1920, lxxxiii, 1490. (88) Compt. rend. Soc. de Biol., Paris, 1920, lxxxiii, 1448. (89) Lehrbuch der gesamten Gynaekologie, Deuticke, Wien, 1898. (90) Monatsehr. f. Geb. u. Gynäk., 1913, xxxviii, 483. (91) Bull. Soc. d' Obst. de Paris, 1901, iv, 110. (92) Arch. f. Kinderh., 1890, xi, 81. (93) Arch. f. Kinderh., 1899, xix, 1. (94) Jahrb. f. Kinderh., 1922, xcix, 20. (95) Deutsch. med. Wehnschr., 1911, xxxvii, 500. (96) Klin. Wehnschr., 1922, i, 995. (97) Le Pédatrie, 1917, xxv, 513. (98) Am. Jour. Dis. Childr., 1920, xix, 429. (99) Quarterly Jour. of Med., 1921, xv, 9. (100) Johns Hopk. Bull., 1917, xxviii, 140. (101) AM. JOUR. OBST. AND GYNEC., 1923, v, 23. (102) Zentralbl. f. Gynäk., 1923, xlvii, 996. (103) Arch. f. Gynäk., 1922, cxvi, 68. (104) Monatschr. f. Geb. u. Gynäk., 1915, xli, 113. (105) *Halban und Seitz*: Biologie und Pathologie des Weibes, i, 635. Urban & Schwarzenberg, Berlin, 1924. (106) Acta Med. Scand., 1922, lvii, 10. (107) *Kraus und Brugsch*: Spez. Pathologie und Therapie Innerer Krankheiten, vol. x, part 3, p. 1. Urban & Schwarzenberg, Berlin, 1922. (108) Zeitschr. f. Geb. u. Gynäk., 1911, lxix, 198. (109) Zeitschr. f. Geb. u. Gynäk., 1912, lxxii, 105. (110) Gynec. et Obst. (Paris), 1922, v, 364. (111) Zentralbl. f. Gynäk., 1918, xlii, 404. (112) Deutsch. Arch. f. klin. Mediz., 1916, cxviii, 408. (113) Surg. Gyn. Obst., 1919, xxix, 450. (114) Arch. Int. Med., 1923, xxxi, 241. (115) Brit. Jour. Exper. Path., 1923, iv, 105. (116) Wien. klin. Wehnschr., 1923, xxxvi, 609. (117) Annali di Ost. e Gin., 1913, i, 113. (118) AM. JOUR. OBST. AND GYNEC., 1920, i, 276. (119) Annales de Gynec. et d'Obst., 1913, x, 477. (120) rev. in Pract. Med. Series, Obst., 1915, v, 64. (121) Wuerzburger Abhandlungen, 1909, ix, 56. (122) Zeitschr. f. Geb. u. Gynäk., 1919, lxxxi, 81. (123) Deutsch. med. Wehnschr., 1921, xlvi, 761. (124) Am. Jour. Med. Sci., 1909, cxxxvii, 1. (125) Brit. Med. Jour., Sept. 15, 1923, p. 445. (126) Brit. Med. Jour., Sept. 15, 1923, p. 450. (127) Jour. Am. Med. Assn., 1923, lxxxix, 383.

METROPOLITAN BLDG.

A MORPHOLOGIC STUDY OF SOME PHASES IN THE DEVELOPMENT OF THE SEX GLANDS OF THE DOMESTIC PIG*

BY KARL M. WILSON, M.D., BALTIMORE, MD.

(From the Carnegie Institute, Laboratory of Embryology)

THIS study was undertaken as a prelude to a more extensive study of certain phases in the development of the human sex glands. A common mammalian type, the domestic pig—*sus scrofa domesticus*—was selected, material from this species being readily obtainable from local abattoirs, and I have succeeded in collecting a very complete series of specimens of developing sex glands, beginning with the earliest stages in embryos of 6 mm. in length and continuing up to the end of pregnancy, which in the pig lasts approximately four months.

The pregnant uteri obtained from freshly killed animals were brought at once to the laboratory, opened, and in the case of the youngest specimens, the wolffian bodies with the attached sex glands were dissected out, while in the older stages the sex glands alone were removed. As a fixative a saturated solution of bichloride of mercury, acidified with 5 per cent glacial acetic acid, was used, and after dehydration, the material was cut in sections 5 and 10 microns thick and stained by various methods. On the whole, the iron-hematoxylin method of Heidenhain was found to be the most satisfactory.

With material obtained from abattoirs it is impossible to determine the age of the various embryos from the sexual history of the animals, as this, of course, is lacking, so the length measurements have been taken as the criteria in differentiating the various stages.

It would seem unnecessary to review the extensive literature which has accumulated on this subject since the appearance of Waldeyer's fundamental work in 1870. For a full review of this subject, the reader is referred to the very complete articles by Waldeyer, as well as those of Felix and Buhler in Hertwig's *Handbuch*, and also the published studies of von Winiwarter and Sainmont on the sex glands of the rabbit, cat and human species. Among those who have studied the development of the sex glands of the pig, B. M. Allen, Skrobansky and Louise Mellroy deserve particular mention.

The course of events can be best understood by a study of the developmental changes in successive stages.

In either sex the first sign of a sex gland is to be found in a slight thickening of the celomic epithelium on the inner side of each wolffian body. This is to be observed in embryos as small as 7 to 8 mm. in

*Lantern demonstration made by invitation before the American Gynecological Society, May 15-17, 1924.

length, (probably 16 to 17 days old). In this early stage the celomic epithelium assumes a more or less columnar arrangement and begins to undergo proliferation, as evidenced by the presence of numerous mitotic figures. The transition between the epithelium of this region, the future genital ridge, and the epithelium covering the remainder of the wolffian body is, however, in this early stage a gradual one, and on the inner side the thickening may be observed to extend over the root of the intestinal mesentery.

DESCRIPTION OF SPECIMENS

Embryo 14 mm. At this stage the wolffian bodies are relatively large structures filling out almost entirely the lateral and posterior portions of the abdominal cavity. The sex gland "anlage" now forms a distinct ridge on the inner side of each mesonephros, and it extends throughout practically its entire length (see Fig. 1—left). In the pig, however, only the middle third of this original genital ridge develops into the sex gland proper (see Fig. 1—right—embryo 22 mm. in length.)

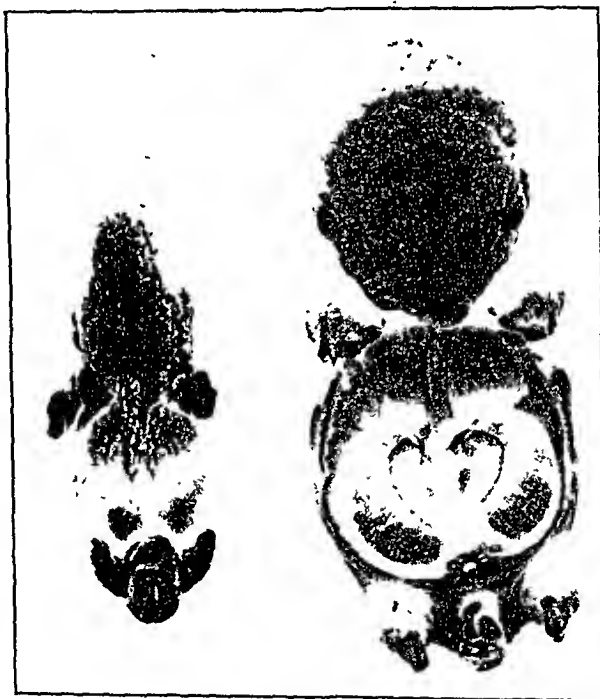


Fig. 1.—Left, pig embryo 14.5 mm. Right, pig embryo 22 mm. Note large wolffian bodies and sex gland region.

Fig. 2 represents a cross section through the dorsal region of a 14.5 mm. embryo. From a study of this section some idea of the relative magnitude of the wolffian bodies can be obtained. The genital ridge can be seen in cross section on the inner side of each mesonephros, the two being separated by the intestinal mesentery. A microscopic study of the cells composing the genital ridge at this stage is of interest.

The cells of the surface epithelium (germinal epithelium of Waldeyer) are arranged in such a manner that their long axes are at right angles, or lie obliquely to the underlying cells. They appear to be proliferating rather rapidly, mitotic figures being fairly numerous, and in places cells are being extended from this

layer into the underlying portion of the sex gland. The great majority of the cells in the underlying portion of the sex gland, which have originated in the above manner from the proliferation of the celomic epithelium, fall in the class of oogonia of the undifferentiated type, and have round or oval nuclei of the protobroque type according to the terminology introduced by von Winiwarter. Their cell bodies are not distinct. An occasional cell of another type is to be observed. These are large round cells with a clearly defined cell body, and contain a large round nucleus whose chromatin is arranged in a network of thin strands. A nucleus is usually to be found. The frequency of their occurrence

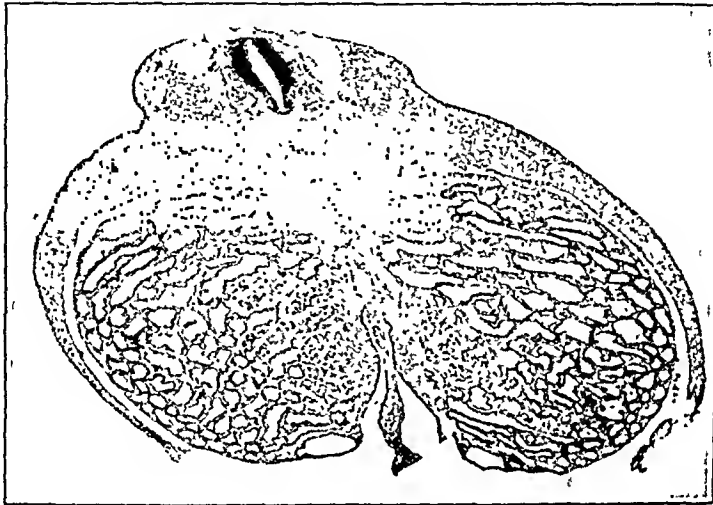


Fig. 2.—Section through dorsal region of 14.5 mm. pig embryo, X20. Note large wolffian bodies in cross section, also genital ridges on their inner sides.

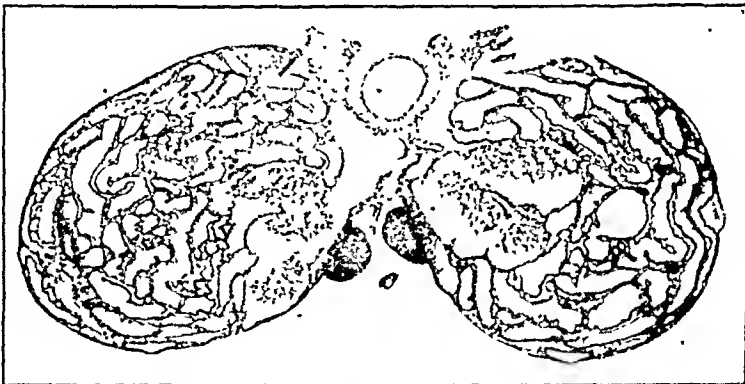


Fig. 3.—Cross section through wolffian bodies and sex glands of an 18 mm. pig embryo, X20.

is very variable. One may examine several sections and find none at all; on the other hand, several such cells are sometimes found in a single section. They are to be found in the surface epithelium, as well as in the deeper portions of the genital ridge, and I have also observed them in other portions of the celomic epithelium, apart from the sex glands: for example in the peritoneal covering of the mesentery. These cells represent the "Ureier" or primordial ova of Waldeyer. They, however, never develop into mature oocytes or spermatocytes, and Allen is probably correct in describing them as primitive sex cells which have undergone a precocious development but for some reason fail to undergo further development.

Embryo 18 mm. in length (Fig. 3). The general increase in size of the sex gland is quite pronounced, so that in section it now appears as a very marked elevation upon the inner side of the mesonephros to which it is attached by a rather broad base. No tendency towards a cordlike arrangement of the cells composing its general mass is to be made out, rather they are grouped together

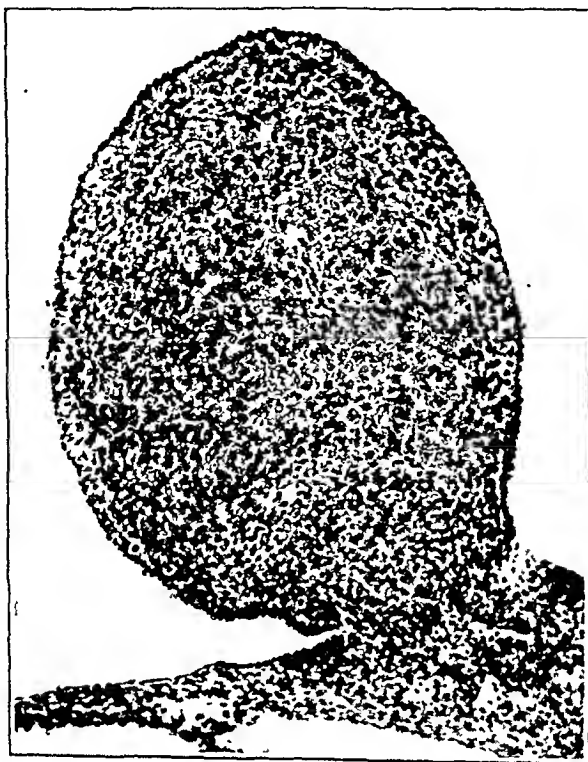


Fig. 4.—Section of sex gland from a 22.5 mm. pig embryo—female. X150.

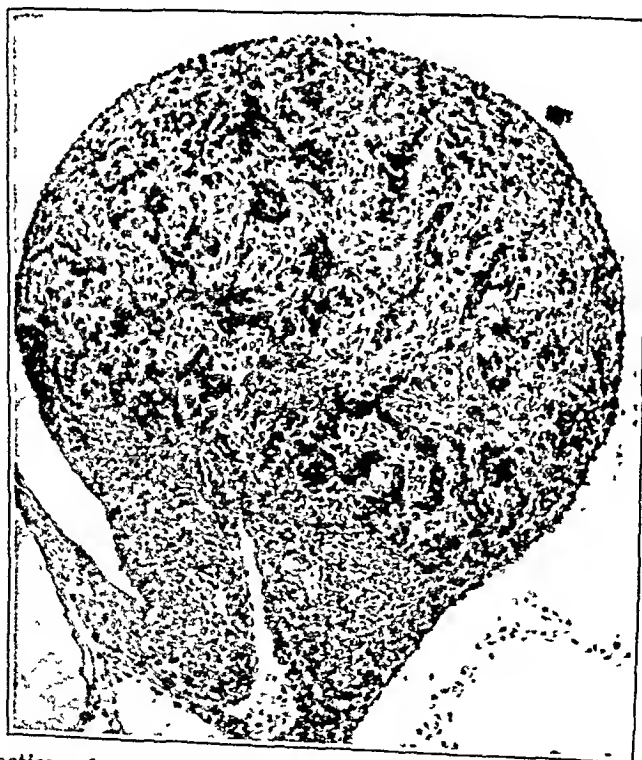


Fig. 5.—Section of sex gland from a 22.5 mm. pig embryo—male. X140.

in a compact arrangement. (It must be borne in mind that variations in the arrangement of the various structures composing the sex gland are to be found, according to the species studied.) The types of cells encountered are similar to those met with in the earlier stage—chiefly oogonia with the protobroque type of nucleus, with an occasional primitive sex cell scattered among them. A new feature, however, is to be observed in the beginning formation of a delicate connective tissue layer between the surface epithelium and the underlying mass of oogonia. The sex gland is still in the indifferent stage, that is to say, it is impossible to decide from the histologic picture presented, whether the given specimen is of the male or female sex.

Embryos 22.5 mm. in length. (Figs. 4 and 5). At this stage the distinction between the two sexes is to be made out with ease. The two embryos under consideration were obtained from the same litter, were of the same size, and appeared to be identical in their general development, yet most striking differences are to be observed in the sex glands.

In the testis (Fig. 5), the following characteristics are to be observed.

1. The surface epithelium has assumed a flattened appearance. From now on it takes no further part in the production of the active sexual products of the testes but simply forms an inactive epithelial covering.

2. Immediately beneath the surface layer is a well defined layer or rather densely arranged connective tissue—the tunica albuginea—which is a permanent structure and corresponds to the albuginea layer of the adult organ.

3. The central mass of cells has rather suddenly become broken up into a series of branching and anastomosing solid cords of cells, separated from one another by the intermediate cords of connective tissue and interstitial cells. These branching cords are the forerunners of the seminiferous tubules.

Comparing the ovary (Fig. 4) with the findings noted above one finds:

1. The surface epithelium retains a distinctly cuboidal appearance.

2. Immediately beneath the surface epithelium is a rather broad layer of loosely arranged connective tissue. This corresponds to the albuginea layer of the testis but in the ovary it is only a temporary structure, the albuginea of the mature organ not appearing until a later date.

3. In the central part of the sex gland the oogonia are still arranged in a compact mass with practically no tendency towards a cord-like arrangement. This central mass of cells in the ovary represents the end-result of what von Winiwarter describes as the first proliferation of the surface epithelium, and it is almost, although not entirely, cut off from connection with the surface epithelium.

From the above findings it is noted that the signs of sexual differentiation in the male are of a distinctly positive character, whereas in the female, they are partly positive and partly negative—differentiation going on more rapidly in the testis than in the ovary.

In addition to the above sign of differentiation certain differences in the vascularization of the testis and ovary are to be observed as was pointed out by Clark. In the testis, the spermatic artery after entering the hilum, pursues its course in the albuginea layer ascending in a longitudinal direction towards the cranial pole, at the same time giving off lateral branches, as well as others which invade the substance of the organ.

In the ovary, however, after entering the hilum, the artery gives off numerous radial branches which follow a somewhat tortuous course and end under the surface of the organ.

Embryos 32 mm. in length (Figs. 6 and 7.) In the testis (Fig. 6) the organ as a whole is seen to have undergone marked development; the sex cords are bet-

ter defined and a well marked pedicle is noted. Otherwise, there are no pronounced changes as compared with the previous stage.

In the ovary (Fig. 7), however, very marked changes are noted when com-

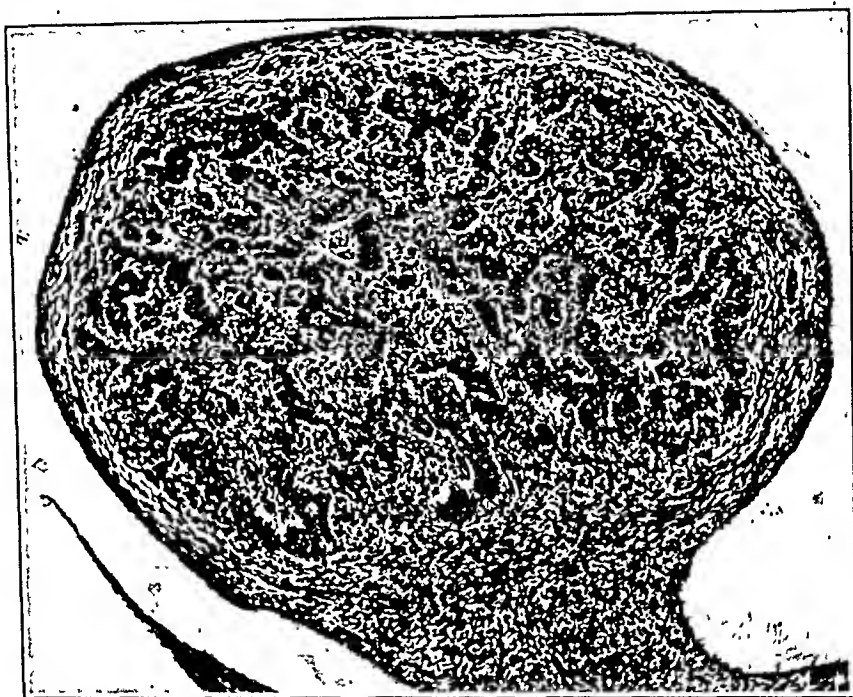


Fig. 6.—Section of sex gland from a 32 mm. pig embryo—male. X90.

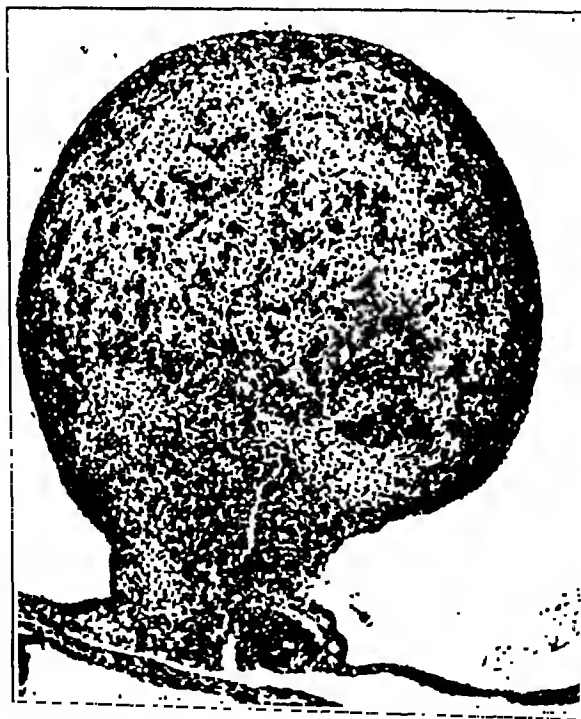


Fig. 7.—Section of sex gland from a 32 mm. pig embryo—female. X100.

parison is made with the preceding stage. The central mass of cells has become more loosely arranged, and has become broken up into irregular cords or islands of cells, separated by connective tissue. These are the medullary cords and cor-

respond to the sex cords which later become the seminiferous tubules in the testis. Around the periphery of the organ it is found that a new layer is forming immediately beneath the surface epithelium, this layer being derived from a second proliferation of the surface epithelium, and representing the beginning of the primitive cortical layer. The primitive albuginea layer, previously noted, thus becomes practically obliterated as a definite layer.

This stage represents the earliest phase in the differentiation of the cortical and medullary regions of the ovary. In the ovary it is this cortical layer which, after further growth and development, becomes the active functional part of the organ, while the medullary cords undergo degenerative changes. In the testicle, on the other hand, it is the central portion containing the sex cords, homologues of the medullary cords, which becomes the actively functioning part of the gland, and once the albuginea layer has formed, the surface epithelium becomes inactive and takes no further part in the development of the organ.

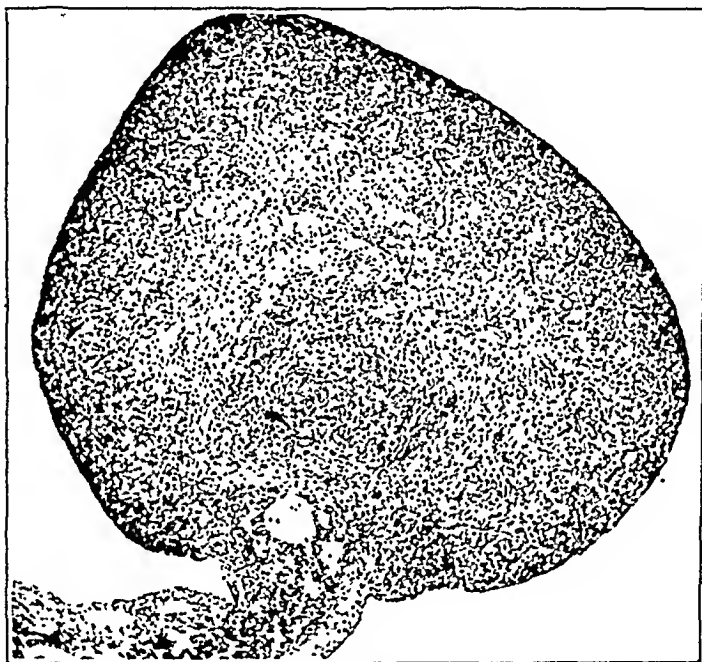


Fig. 8.—Section of ovary from an 80 mm. pig embryo. X75.

No further study will be made of the testis; attention will now be devoted to the further developmental changes which occur in the cortical layer of the ovary.

Embryo 80 mm. (Fig. 8). In the ovary of this specimen we find that the whole organ has increased in size. There is a marked distinction between the cortical and medullary zones. The former has increased very materially and contains a great number of oogonia. The medullary cords have become still further broken up and many of their cells show degenerative changes.

The phases in the development of oogonia into oocytes can now be studied. This begins in the deepermost portion of the cortical layer, gradually extending towards the periphery, so that the differentiation of oocytes may be described as being centrifugal in its progress. In the specimen under consideration we find that this differentiation has begun. At this stage the great majority of the cells in the primitive cortical layer are undifferentiated oogonia with nuclei of the proto-

broque type. These have been constantly increasing in number by proliferation of the surface epithelium, as well as by division and multiplication of the cells thus formed. With the beginning differentiation of oocytes further division of such cells ordinarily ceases. The oogonia in the deepest portion of the primitive cortical layer, after passing through transition stages involving an increase in size, as well as nuclear changes, become oocytes with nuclei of the deutobroque-leptotène type of von Winiwarter. These cells have increased materially in size as have also the nuclei. A fine net-work of chromatin material is to be observed in the nucleus, its filaments tending to converge towards the nucleolus. Another point to observe at this stage is the beginning extension of numerous connective tissue processes from the central portion of the ovary into the primitive cortical

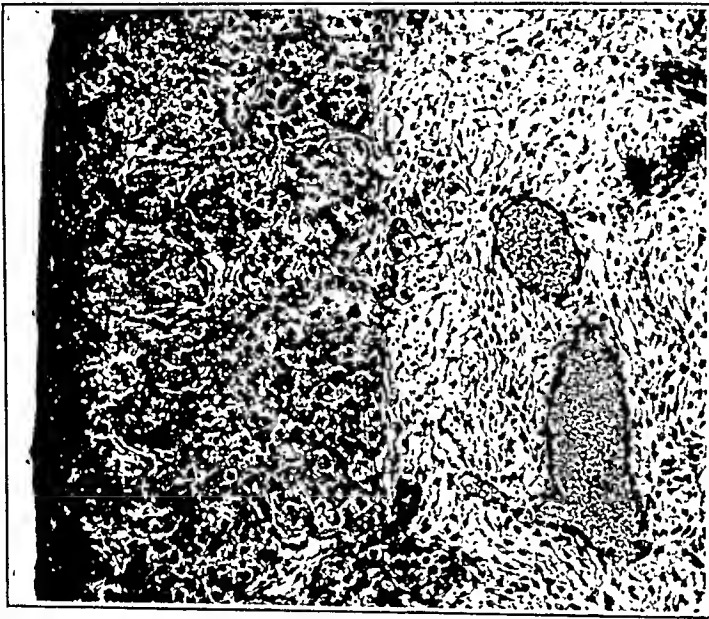


Fig. 9.—Section through primitive cortical zone of ovary from a 90 mm. pig embryo. X140. Note darkly staining nuclei of oocytes in synapsis stage in deeper portion, also "cell nests."

layer. This eventually results in the breaking up of this zone into masses or nests of oogonia and oocytes—the cortical cords or Pflüger's tubes.

Embryo 90 mm. in length (Fig. 9—cortical zone). In this specimen the most deeply lying oocytes have passed beyond the deutobroqueleptotène stage, and are now in the synapsis stage. These oocytes are readily recognized in the print as the most deeply lying ones with large darkly staining masses of chromatin in their nuclei. This is a rather prolonged stage in their development and involves a number of factors. The chromatin of the nucleus assumes a skein-like appearance at one side of the nucleus, the filaments being arranged in pairs. The arrangement of the filaments becomes more dense and they finally appear to become disentangled from the general skein and then spread themselves over the whole nucleus in the form of rather thick threads. External to these are found oocytes in earlier stages of differentiation with nuclei of the deutobroque-

leptotène type, and just under the surface epithelium is a zone in which are still undifferentiated oogonia. The invasion of the primitive cortical layer by connective tissue strands and the breaking up of this zone into "cell nests," which was observed to be beginning in the preceding stage, it now quite advanced. In these "cell nests" are to be found clusters of oocytes in the various stages of differentiation as well as numerous undifferentiated oogonia. The latter are beginning to show a tendency to arrange themselves around the individual oocytes.

Embryo 146 mm. in length (Fig. 10—cortical zone). Marked progress in the differentiation of oocytes and the development of the cortical zone is observed in this stage. In the further growth of the oocytes the nucleus passes from the stage of synapsis to the pachytène type of von Winiwarter, which has an irregular arrangement of the rather thick chromatin thread; this in turn being succeeded by changes resulting in the formation of the diplotène type of nucleus. It is this latter type which is found in the earliest primordial follicles. When this stage

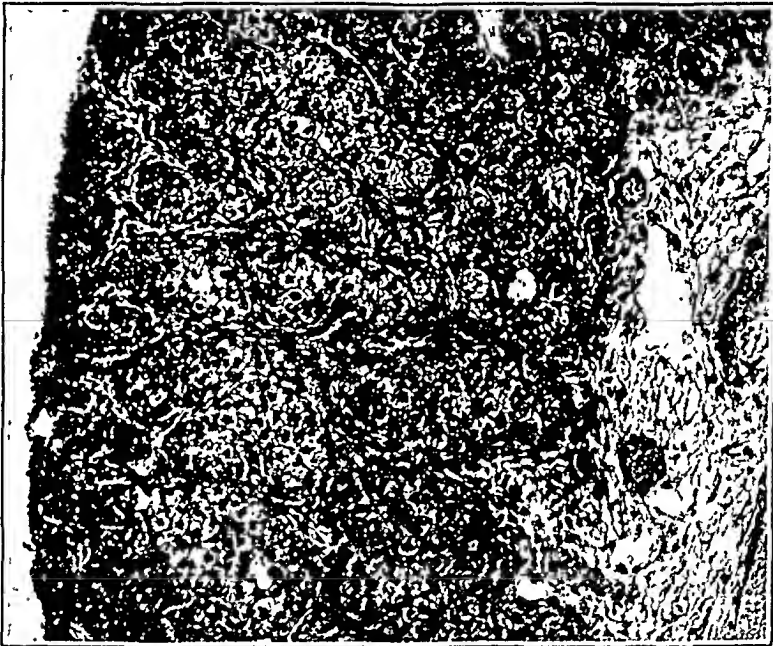


Fig. 10.—Primitive cortical zone of ovary from 146 mm. embryo. X140. Note early primordial follicles in deeper portion, "cell nests" and nuclei in synapsis stage in middle portion.

is reached the oocyte and its nucleus have both increased materially in size, a large nucleolus is to be found and the striking feature is the longitudinal division which the chromatin filament has undergone, so that it now appears as a double thread.

In the specimen under consideration some early primordial follicles containing oocytes in this stage are found in the deepest portion of the cortical layer, some of them entirely, others only partially enveloped by undifferentiated oogonia which are assuming a rather flattened appearance. About the middle of the cortical zone the differentiating oocytes are seen to have reached the synapsis stage, while superficial to this again are to be found oocytes in earlier stages of differentiation, and immediately beneath the surface epithelium a gradually narrowing zone of undifferentiated oogonia. By the further growth of connective tissue the "cell nests" or "cortical cords" are becoming more and more broken up into smaller units in the deeper portion of the cortical layer.

Embryo 200 mm. in length (Fig. 11 low power—Fig. 12 cortical zone). At

this stage a number of fully developed primordial follicles are found in the deepest portion of the cortical layer. In these the oocyte has undergone further development and its nucleus is now of the dietyé type described by von Winiwarter. The oocyte and its nucleus have increased still further in size. The chromatin thread is, however, no longer double, but single, while numerous granules

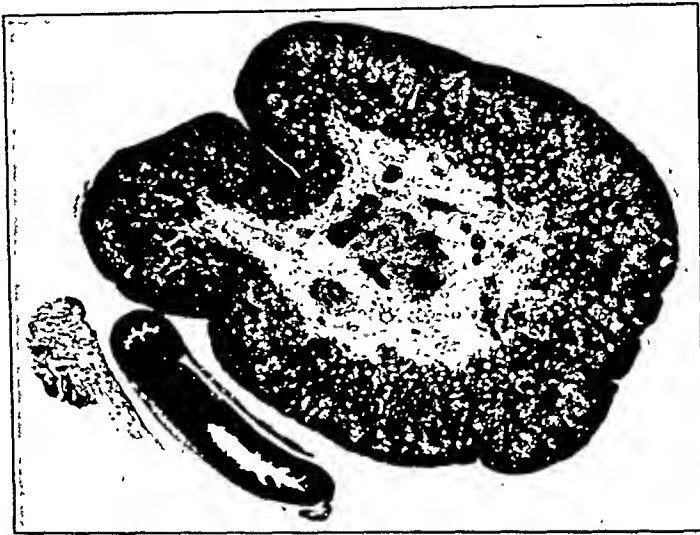


Fig. 11.—Section through ovary of a 200 mm. embryo. X50.



Fig. 12.—Primitive cortical zone of section of ovary shown in Fig. 11. X140.

are to be found. This represents the resting stage of the oocyte as found in the fully developed primordial follicle. Each of these has a covering composed of a single layer of undifferentiated oogonia which have assumed a very flattened outline giving them an appearance quite like connective tissue cells, but having traced the course of events in the earlier stages, and having observed their beginning arrangement around the differentiated oocytes at a time when the oogonia could be definitely identified as such, the nature of the covering of the fully developed

primordial follicle becomes apparent. Further growth of connective tissue has isolated the individual primordial follicles from one another, so that in the deepest portion of the cortical layer we no longer encounter "cell nests." More superficially, well defined Pflüger's tubes are still to be observed, containing oocytes in the earlier stages of differentiation, as well as undifferentiated oogonia. Indeed, in this particular specimen practically all stages in the course of the differentiation of the oocytes, from the oogonia lying just under the surface epithelium to the primordial follicles in the deepest portion containing oocytes with the dicty type of nucleus, are to be observed.

Embryo 242 mm. in length (Fig. 13 cortical zone). This represents the stage just before birth. Differentiation of the oogonia into oocytes and the formation of the definitive cortical zone with its primordial follicles is almost complete. The ovary of the pig is comparable to that of the human, in that a high state of development is attained before birth. Superficially a few small "cell nests" are found containing oocytes in the synapsis stage and the earlier stages of dif-



Fig. 13.—Primitive cortical zone of ovary from a 242 mm. embryo. X140.

ferentiation. The zone of undifferentiated oogonia immediately beneath the surface epithelium has almost entirely disappeared and is being replaced by a connective tissue layer,—the definitive albuginea layer of the mature ovary.

A point to which I have not drawn attention in the description of the various specimens, but which should be emphasized, is in connection with the degenerative changes which overtake great numbers of oocytes in various stages of their development. Comparing this stage with the earlier ones it at once becomes apparent from the illustration that the number of egg cells in the cortical layer has very materially diminished. This has been brought about by degeneration of many of the oocytes. This can occur at any period in the course of their development, from the earliest stages up to and including the

primordial follicles themselves. As was pointed out by Clark and Kingsbury this may possibly be due to lack of proper vascular and nutritive supply for the affected follicles or oocytes.

Von Winiwarter states that this is the fate which overtakes all the primordial follicles formed before birth or in early postnatal life, and that in the cat a third proliferation of the covering epithelium of the ovary occurs just before the period of sexual maturity, resulting in the formation of the definitive cortical zone which will give rise to the production of definitive ova. Kingsbury, however, studying the same species doubts the occurrence of this third proliferation. My own material does not permit any statement on this point.



Fig. 14.—Cortical zone of ovary from pig one month old—41 cm. long.

Ovary from pig one month old. (Fig. 14) This stage is on the whole comparable to that of the human infant at birth. The definitive number of primordial follicles is present. Most of them are completely isolated from one another by the connective tissue stroma. In the deeper portions several are found undergoing further development as early graafian follicles. These, however, will doubtless undergo atresia.

SUMMARY

In the pig the genital ridge develops on the inner side of the wolffian body and results from a proliferation of the celomic epithelium in that region, the resulting cells being undifferentiated oogonia. After a time the cells resulting from this proliferation become separated from the surface epithelium by a connective tissue layer. The mass of cells becomes more loosely arranged in cord-like structures—the forerunners of the seminiferous tubules in the male—

the medullary cords in the female. In the male these cords become the actively functioning part of the sex gland. In the female they eventually degenerate.

Sexual differentiation by the histologic picture presented is easily made out at the stage of 22.5 mm.

In the ovary a second proliferation occurs resulting in the formation of the primitive cortical zone, composed in its early stages almost entirely of undifferentiated oogonia. Differentiation of these oogonia into oocytes goes on in a centrifugal direction—the most highly developed ones being found in the deepest portion of the cortical zone. During the course of this process of differentiation, many of the oocytes degenerate. In the pig the process of differentiation and formation of primordial follicles is not quite completed at the time of birth, but is completed early in postnatal life.

REFERENCES

No attempt is made to present a complete bibliography. Only those articles referred to in this paper are presented.

Allen, Bennet Mills: Amer. Jour. Anat., 1904, iii, 89. *Clark, J. G.*: Johns Hopkins Hosp. Reports, ix, 190. *Felix and Buhler*: Hertwig's Handbuch der verg. und exp. Entwicklungslehre der Wirbeltiere, 1906. *Kingsbury*: Amer. Jour. Anat., 1913, xv, 345. *McIlroy, Louise*: Proc. Royal Soc. of Edinburgh, 1910. *Sainmont*: Archives de Biologie, 1906-07, xxii, 71. *Skrobansky*: Arch. f. Mikr., 1903, vol. lxii, 607. *Waldeyer*: Hertwig's Handbuch der verg. und exp. Entwicklungslehre, 1906. *von Winiwarter*: Arch. de Biologie, 1901, xvii, 33. *von Winiwarter and Sainmont*: Archives de Biologie, 1909, xxiv, 1.

THE RESULTS OBTAINED IN A CONSERVATIVE TEACHING CLINIC AMONG 2500 NEGRO PATIENTS*

BY J. R. McCORD, M.D., ATLANTA, GA.

(Associate Professor of Obstetrics and Clinical Gynecology, Emory University)

THIS work was done in the Obstetrical Clinic of the Emory University School of Medicine, Atlanta. The city has a colored population of about 75,000. Our clinic serves the total charity population, which is practically the entire population, and is the only refuge for badly handled cases. Sixty per cent of all negro births reported are cases delivered on our service.

All of the normal cases in our series were delivered by senior students, under the direction of the resident obstetrician. The operative work, in large part, was done by a colleague and myself. The service in our clinic has been entirely indoors for the past several years, enabling us to exercise a closer supervision at all times. All of our obstetrical teaching revolves around two things: the mechanism of labor and conservatism.

At the present time a majority of the cases admitted may be classed as poor surgical risks. Their living conditions are poor, hygiene miserable, food insufficient and poorly balanced. Nearly all of the cases are anemic. Four-plus Wassermanns are present in 30 to 35 per cent of the cases. Oral sepsis, chronic tonsillitis and constipation are the rule. Only 50 to 60 per cent of the cases delivered have attended the prenatal clinic.

DEATHS

The total number of deaths in the series was 61, making a total mortality rate of 2.4 per cent. We think that the following cases should not be counted:

8366—Eclampsia; admitted to hospital delivered and unconscious; in hospital but five hours.

7338—Eclampsia; death two hours after admission.

10—Eclampsia and puerperal sepsis; admitted several days postpartum.

8557 and 8923—Both eclampsia; admitted postpartum.

473—Peritonitis general; frank infection when admitted.

8187—Pyemia; admitted with retained placenta, which was expelled spontaneously; several examinations by a midwife prior to admission to hospital.

7958—Peritonitis general; aborted at five months, prior to admission; temperature when admitted 101 degrees.

5784—Gas bacillus infection; attended on the outside by a midwife and admitted with only the head delivered.

*Read by invitation before the Forty-ninth Annual Meeting of the American Gynecological Society, Hot Springs, Virginia, May 15, 1924.

4523—Puerperal sepsis; delivered outside hospital.

3415—Peritonitis general; septic abortion; delivered outside hospital.

9—Puerperal sepsis; died twenty-five minutes after admission.

6562—Puerperal sepsis; admitted seven days postpartum.

7659—Typhoid fever.

23—Pernicious nausea and vomiting; in hospital but twenty-four hours.

47—Uremia; four months pregnant and admitted in coma.

3725—Uremia; died thirty minutes after admission.

If we are permitted to omit these seventeen cases, we have a corrected mortality rate of 1.7 per cent. Below are listed some cases that we must accept, but which, we feel, were beyond human control:

Cases 6786 and 6620 both died of puerperal sepsis. The labors were normal, and no vaginal examinations were made. Cases 2630 and 1778 both died of general peritonitis. These labors were normal, and no vaginal examinations were made.

The causes of all deaths were as follows:

Chronic Nephritis	4	Uremia	8
Streptococemia	1	Lobar Pneumonia	1
General Peritonitis	13	Eclampsia	15
Pyemia	1	Typhoid Fever	1
Puerperal Sepsis	8	Tubercular Peritonitis	1
Gas Bacillus Infection	1	Cerebral Hemorrhage	1
Pernicious Vomiting	1	Ruptured Uterus	1
Cardiac Decompensation	1	Septic Thrombophlebitis	1
Abscess Lung	1	Undetermined	1

It will be noted that throughout this analysis the nephropathies, toxemias and eclampsias are more or less arbitrarily divided. Twenty-seven cases died from these conditions, 44 per cent of the total mortality; 25 cases died from infection, 41 per cent of the total mortality, the two combined giving us a total of 85 per cent of all deaths.

FORCEPS

Forceps were applied forty-one times, an incidence of 1.6 per cent. The maternal mortality was 14.5 per cent, the fetal 14 per cent. Causes of death in the mothers were: eclampsia, two; lobar pneumonia, one; general peritonitis, two; pyemia, one. Indications for interference in these cases follow:

6811—This patient had been horribly burned about the face. Both eyes were completely destroyed. Her deformity was terrible. She had eclampsia, with an R. O. P. position. A Scanzoni operation was done. Patient died of eclampsia.

1074—Eclampsia; multiple pregnancy. The membranes were ruptured artificially. A low forceps operation was done on the first child, a breech extraction on the second. Cause of death was lobar pneumonia.

3802—A low forceps operation was done for eclampsia. The position was normal. Autopsy revealed a marked fatty degeneration of the liver and a cloudy swelling of both kidneys.

3965—This case had a frank infection upon admission to the hospital and a positive smear for gonorrhea. A low forceps operation was done. The patient died of general peritonitis.

8187—Normal position; uterine inertia; low forceps; retention of placenta twenty-eight hours, expelled spontaneously. Cause of death was pyemia.

8917—A low forceps operation seemed indicated on account of eclamptic convulsions. The mother died of a general peritonitis.

Fourteen babies were stillborn, and of this number only one was macerated. Six babies were stillborn of eclamptic mothers. One was stillborn after a Seanzoni operation through a simple flat pelvis. The patient was in labor sixty hours.

A low forceps operation was done for an uterine inertia. The baby was stillborn. Spirochetes were found in the liver. In a case of generally contracted pelvis, a Seanzoni operation was done and the baby was stillborn. One stillbirth was of a nephritic mother, in whom labor had been induced and terminated by a Seanzoni operation.

A stillbirth resulted from a midforceps operation in a generally contracted pelvis. A midforceps was done on a R. O. P. position. Delivery had been attempted outside the hospital. The operations were classified as follows:

Seanzoni	8	Medium	7
High	1	Low	25

Of the Seanzoni maneuvers, four babies were stillborn. Four of these operations were done during the first 600 cases of the series. We are convinced that this operation is technically difficult, dangerous and to be chosen only after very careful deliberation. Eighteen per cent of the forty-one cases had fever during the puerperium.

The indications were:

Pelvis flat	1	Generally contracted pelvis	6
L. O. P. positions	2	R. O. P. positions	2
Eclampsia	6	Uterine inertia	12
Hypertension	4	Maternal exhaustion	1

POSTPARTUM HEMORRHAGES

A very little blood seems like a hemorrhage to the average student. Of the 35 cases indexed as hemorrhages, 28 were delivered by students. Not a single mother in the entire series died of hemorrhage. Two were normal labors, one a placenta previa partialis, the other a hypertension. Our rule in conducting the third stage of labor is to give an ampule of pituitrin as soon as the baby is born, and then let the uterus alone. These cases were arbitrarily divided into the following classes:

Slight	5	Moderate	13
Mild	12	Severe	5

No treatment was required in five cases. The placenta was removed manually three times, and expressed three times. Uterine massage and oxytoxics were used in 20 cases. In only four cases was the uterus tamponed. Three of these cases had fever during the puerperium and one of these was diagnosed as a sepsis. Twenty-eight of the 35 labors were normal.

VERSION, INTERNAL PODALIC

Out of the 10 internal podalic versions done in the series, an incidence of 0.4 per cent, one case was, we think, badly handled. In explanation of the high fetal mortality, 100 per cent, I submit an abstract of every case upon which an internal podalic version was done:

2918—Prolapse of arm and cord, upon admission; transverse; Sc. L. A., fever upon admission; pulse 150; stillbirth; macerated.

3358—Fibroid, right lower segment of uterus; prolapse of cord; toxemia of pregnancy (case badly handled).

6093—Transverse position; Sc. L. P.; prolapsed arm; premature; hypertension. The arm was pulled off by an outside doctor before admission to the hospital.

6817—Transverse; Sc. L. A.; prolapsed arm; Bandl's contraction ring.

7272—Eclampsia; manual dilatation of cervix; hemorrhage postpartum; uterine tamponade.

7684—G. C. pelvis; pre-eclamptic toxemia; artificial rupture of membranes; marginal placenta previa; manual removal of placenta.

110—Placenta previa partialis; postpartum hemorrhage; manual extraction of placenta; sepsis.

1490—Eclampsia; induction of labor (bag); manual dilatation of cervix; third degree tear.

6376—G. C. Pelvis; placenta previa centralis; intrauterine death of fetus; manual removal of placenta.

8057—Hypertension; face presentation.

There was no maternal mortality. Seven cases, 70 per cent, had fever during the puerperium.

INDUCTION OF LABOR

Ninety-two inductions of labor were done, an incidence of 3.7 per cent. The indications for the inductions follow:

Nephritis in 30.4 per cent of the cases; eclampsia in 21.4 per cent; toxemia of pregnancy in 22.4; and pre-eclamptic toxemia 13 per cent.

The maternal mortality was 12 per cent, the fetal, 36 per cent. We believe that labor is more readily induced in the negro woman than in the white woman. Eighty-seven and two-tenths per cent of all the inductions were done for some toxemia. The causes of the maternal deaths follow:

Eclampsia	4
Peritonitis general (both eclamptic)	2
Peritonitis tuberculous	1
Uremia	2
Nephritis Chronic	2

The methods used in inducing the labors were:

Catheter	4	Bag	33
Catheter with rupture of membranes	3	Bag with rupture of membranes ..	6
Pituitrin	5	Rupture of membranes	4
Castor oil and pituitrin	1	Castor oil and quinine	30
Bag and catheter	3	Castor oil, quinine and catheter ...	1
Bag and pituitrin	2		

We rarely use the bag now, and of the thirty-three cases mentioned, nearly all occurred early in the series. Forty per cent had fever during the puerperium. Prolapse of the cord occurred twice.

MANUAL REMOVAL OF THE PLACENTA

The placenta was removed manually eighteen times, an incidence of 0.07 per cent. Of these eighteen cases twelve occurred in the first 600 cases of the series. Four mothers died, a mortality of 22 per cent. Fifty-two per cent had fever during the puerperium.

The causes of death were: Cardiac decompensation, 4394; pneumonia, double lobar, 5167; peritonitis, general (badly handled, placenta accreta), 473.

Below are listed the indications for seventeen of the cases:

Cardiac decompensation	1
Postpartum hemorrhage	3
Placenta previa	3
Placenta accreta	1
Lobar pneumonia (retention 72 hours in lower segment)	1
Retention for varying number of hours	3
Generally contracted pelvis, prolapse cord, contraction ring, dead baby, craniotomy	1
G. c. pelvis, R. O. P. Scanzoni	1
Eclampsia, version, craniotomy, dead baby	1
G. c. pelvis, prolapse cord, contraction ring	1
No indication	1

RETAINED PLACENTA

In thirteen cases the placenta was retained for more than three hours. The time in hours each was retained was: 96—72—4—48—28—72—72—36—8—48—4—3. Seventy-six per cent of the cases had fever during the puerperium. Four mothers died, a mortality of 31 per cent. The causes of death were:

- 473—Retained 72 hours, 6 months' baby, manual removal, placenta accreta, hemorrhage, tampon, puerperal sepsis.
- 5187—Five examinations by midwife, inertia, low forceps, placenta retained 28 hours, spontaneous expulsion, pyemia.
- 5167—Placenta retained 72 hours, manual removal, lobar pneumonia double.
- 4405—Septic abortion (incomplete), delivered outside, retained placenta 72 hours, removed with sponge forceps, general peritonitis.

In six of the thirteen cases the placenta was expelled spontaneously. It was removed manually three times and expressed once. Manual dilatation and extraction was done once, and instrumental re-

moval twice. Seven of the cases were incomplete abortions; two had postpartum hemorrhages; seven had outside manipulation. The uterus was tamponed two times. One case developed sepsis, another general peritonitis. Three were premature labors.

CESAREAN SECTION

Seven cesareans were done, an incidence of 0.28 per cent. Two mothers died, making a maternal mortality of 28.6 per cent. One baby was known to be dead when an extraperitoneal cesarean was done for a generally contracted pelvis, after attempts to deliver from below had been made. This case might have been better had it been handled differently. This case also gave us 50 per cent of our mortality, dying of a septic thrombophlebitis. The other death was caused by streptococemia. The pelvis was generally contracted, patient was in labor ninety hours, exhausted, membranes having been ruptured twenty-four hours. The position was an R. O. P. and Beck's operation was done. The other babies were delivered in good shape. The indications with the type of operation were:

Intraligamentous cyst, premature rupture membranes, test of labor	Beck's operation
Generally contracted pelvis, 90 hours' labor, exhaustion, membranes ruptured for 24 hours, live baby, R. O. P. position	Beck's operation
Flat pelvis, former section for eclampsia	Classical, with high incision
Cerebrospinal syphilis, convulsions, primary uterine inertia	Classical, with low incision
Eclampsia	Classical, with high incision
Eclampsia (twin pregnancy)	Classical, with high incision
Prepartum infection, g. c. pelvis, attempt high forceps, craniotomy	Extraperitoneal

We have been criticized on account of undue conservatism. The negro is usually a poor surgical risk, particularly in acute toxemias. At the present time we do not regret our conservatism.

TAMPONADE OF UTERUS

The uterus was packed in ten cases. Two mothers died, a mortality of 20 per cent. Eight of these ten cases had fever during the puerperium. In five of them the placenta was removed manually. The causes of death were: cardiac decompensation and puerperal sepsis (placenta accreta).

INDICATIONS AND COMPLICATIONS

Hypertension	3	Manual dilatation cervix	2
Uterine inertia	2	Manual removal placenta	5
Eclampsia	1	Scanzoni forceps	1
Abortion	1	Hemorrhage postpartum	5
Retention placenta	2	Forceps low	2
R. O. P. position, g. c. pelvis....	1	Sepsis	2
Placenta previa	1	Placenta accreta	1
Version internal podalic	2	Prematurity	2

MANUAL DILATATION OF THE CERVIX

Of the seven cases in which the cervix was dilated manually, or rather in which the dilatation was completed, one was an abortion, one a partial placenta previa and five pregnancy toxemias. The incidence was 0.3 per cent and the maternal mortality 33 per cent; one mother died of eclampsia, the other of uremia. Omitting one abortion, in the remaining six cases there was not a single live birth. The results were so poor, that all seven cases are abstracted below.

- 249—Abortion, retention of placenta two days, slight dilatation of cervix and placenta removed from lower segment.
- 3141—Eclampsia, multipara, premature rupture of membranes, delivery not completed, death of mother and baby (uremia ?).
- 3559—Toxemia of pregnancy, transverse position, fever, para v, manual dilatation of cervix, death of mother in two hours, stillbirth.
- 7272—Eclampsia, manual dilatation of cervix, internal podalic version, hemorrhage, tampon, fever in puerperium, stillbirth, recovery of mother.
- 110—Placenta previa partial, manual dilatation of cervix, internal podalic version, hemorrhage, manual removal of placenta, tampon, puerperal sepsis, stillbirth, recovery of mother.
- 1490—Eclampsia, induction of labor (bag), manual dilatation of cervix, internal podalic version, fever in puerperium, third degree tear, recovery of mother, stillbirth.
- 5036—Eclampsia, induction of labor (bag), manual dilatation of cervix, internal podalic version, manual removal of placenta, recovery of mother, stillbirth.

CRANIOTOMIES

Two craniotomies were done on living babies:

- 1378—Early rupture of membranes; many examinations by midwife; twelve hour test of labor in hospital; g. e. pelvis; forceps attempted on floating head; craniotomy on living child; death of mother; septic thrombophlebitis.
- 8735—A large semicystic tumor of the neck; size of fetal head was obstructing labor. A craniotomy was done on the living baby as the only way to effect delivery.

These 2500 cases are the results of the first teaching prenatal clinic for negroes in the Southeast. The Clinic has proved so acceptable to the negro population, that 60 per cent of the reported negro births are from this Clinic.

The mortality rate is high, but when one considers the disease, poverty, ignorance and unsanitary environment in which the patients live, a gentler judgment is probably justified.

The material is so abundant, the complications and pathology so varied, that its influence upon the teaching of obstetrics in this section of the country is almost invaluable.

A FURTHER STUDY OF THE ORIGIN OF UTERINE BLEEDING IN TUBAL PREGNANCY*

BY JOHN OSBORN POLAK, M.D., AND SAMUEL A. WOLFE, M.D.,
BROOKLYN, N. Y.

IN 1921, before the American Association of Obstetricians, we presented a preliminary report on the study of the origin of uterine bleeding in tubal pregnancy. In this paper we drew an analogy between intrauterine pregnancy and tubal gestation; and showed that there was no uterine bleeding in either until threatened abortion occurred or rupture of the tube took place.

In continuing this study in 65 recent cases of tubal pregnancy, we have been impressed by the persistence of vaginal bleeding following the removal of the gestation sac; therefore, it occurred to us that routine curettage (except in urgent cases) prior to salpingectomy, might indicate in a relative way, when the uterine findings were correlated with the clinical history and the findings in the tube; the probable time of the death of the ovum—and also help to explain the cause of vaginal bleeding in ectopic. The presence of decidual elements would indicate a living or a very recently destroyed ovum.

In 20 cases, postoperative uterine bleeding persisted for periods varying from a week to 15 days following the removal of the tube with its contained pregnancy—in 5 of these cases the uterine cavity was subsequently curetted—and some of our deductions are based on these findings.

The question therefore arises, as to how this vaginal bleeding can be explained—is this bloody discharge the effect of subinvolution as shown by Sampson or is it a result of the erratic decidual formation within the uterus which desquamates and is cast off in shreds in the vaginal discharge?

In both intrauterine and extrauterine pregnancy, the coverings of the ovum are the same—the chorion possesses the same trophoblast producing cytotoxicity of the cells of the mucosa and burrows its way either into a fold of the mucosa, or between adjoining folds which usually surround the ovum until it finally rests upon the subepithelial layer of the muscularis.

Unfortunately the decidual reaction in the tube owing to its scant stroma is incomplete, scattered and scanty, and does not protect the muscularis from invasion, as does the more perfectly formed decidua within the uterus, hence the dilated vascular and lymph spaces are

*Read at the Forty-ninth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 15-17, 1924.

exposed to the direct erosive action of the covering cells of the villi as the ovum imbeds itself in the tubal wall.

As this erosion takes place into the large tubal vessels and the venous radicals are invaded, an effusion of blood far beyond the needs of the fetus occurs, and this hemorrhage crowds the intervillous spaces with blood, irritates the muscle, provokes contraction and disturbs the implantation of the ovum or may rupture through the internal or external capsule and interrupt its further development.

On serial section, if the ovum is alive, one occasionally finds islands of decidual reaction, not only near the point of implantation and in the uterus, but even in the other tube. This is identical with the decidual reaction found in the unpregnated horn of a uterus didelphys with pregnancy in the other horn.

Therefore, it will be seen that the chief difference between imbedding in the uterus, from that of imbedding in the tube, is the thick decidua which is found in the uterus and the scanty, scattered, non-protecting decidual reaction which is found in the tube.

Furthermore, as has been shown by Sampson's injected specimens, the vessels in the uterus with which the trophoblast comes in contact, are terminal radicals of very small size, while in the tube the vessels are very much larger and because of the penetration of the villi into the muscular layer of the tube, the hemorrhage is greater. Hence the seat of the ovum is unsettled and gives rise to attacks of tubal colic and uterine bleeding—again, the uterine muscle is capable of stretching and hypertrophy, and thus more easily accommodates itself to the growing ovum. This occurs in interstitial pregnancy; while in the tube the edematous and hemorrhagic muscle wall has its limitations. The growing ovum, especially at the point of placental development distends and weakens the tube, and the blood which fills the intervillous spaces bursts through into the ovular capsule at its thinnest point, namely, toward the lumen and separates the ovum from its bed to a greater or less extent.

These changes explain the frequency of tubal abortion, the fact that these abortions are often incomplete and the development of the embryo faulty, while the trophoblast may continue its erosive action and still maintain an impaired circulation in the ovum.

Clinical and pathologic observation has shown that the development of a tubal pregnancy always produces a decidual reaction in the endometrium of the uterus, similar to, but not so extensive as that which develops in a normal pregnancy; and that the uterus enlarges to a greater or less degree as the tubal pregnancy progresses.

The possibilities of this line of investigation are well shown in these four illustrative cases, recently seen in the gynecologic service of the Long Island College Hospital.

CASE 1.—Mrs. M. L. was seen in the outpatient service on March 24, 1924, complaining of vaginal bleeding and pain in the left lower abdomen. Menstruation began at thirteen, no irregularities were noted until present illness. Last period from February 17 to 22, 1924. March 10, spotting began; on the 17th, bleeding became more profuse and was associated with pain in the left lower abdomen with a feeling of faintness.

There was definite tenderness in the left lower quadrant; vaginal bleeding was present; cervix tender to motion, and a tender mass filled the left lower quadrant; a shaggy uterine cast projected from the patent cervix which was removed with ease (the microscopic features, typical of an endometrial decidua, are well shown in the photomicrograph, Fig. 1). Hospital treatment was refused by the patient at this time. Following separation of the cast, vaginal bleeding ceased for six days, but the pain persisted. On April 12, bleeding recurred associated with severe colicky pain in the left lower abdomen. The patient was admitted as an

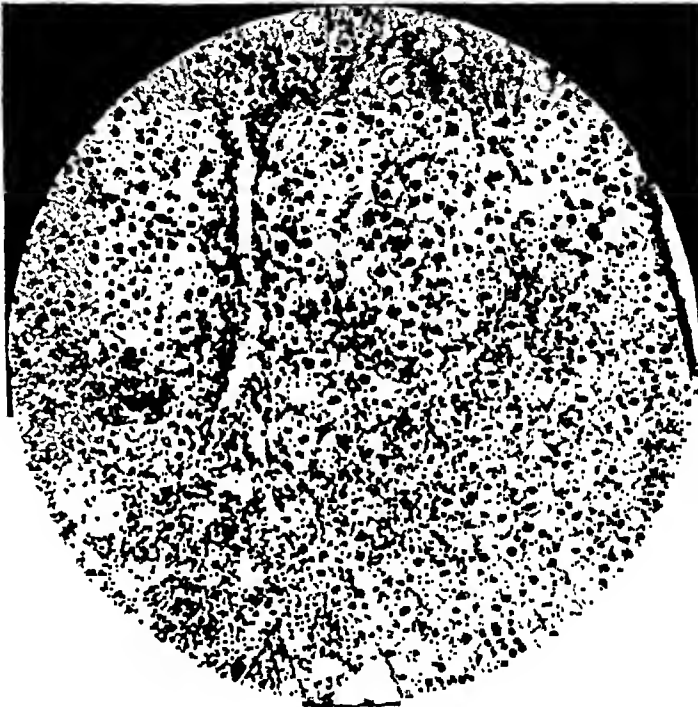


Fig. 1.—Case 1, (11,198) X20. Decidual cast of uterus. Its separation and expulsion demonstrate one mechanism of vaginal bleeding in ectopic gestation.

emergency ectopic to a city institution and immediately operated. The specimen, unfortunately, was not conserved for complete study. The pathologist reported "old tubal abortion."

Summary.—Three weeks before operation a decidual cast was separated and spontaneously expelled from the uterus. At operation "old tubal abortion" was found. From the history the cast expulsion followed one week after effects of tubal abortion, as noted clinically by the onset of cramps in the left lower abdomen.

CASE 2.—Mrs. V. R. was admitted to the Long Island College Hospital on April 7, 1924. Menstruation began at fourteen, twenty-eight day type, four to five days, always regular. Married three years, never pregnant. Last period from February 16 to 20. Present illness dates from March 16. On that date

her period began, but the flow was more marked than usual (the duration increased to two weeks) and associated with abdominal cramps. From March 31, to April 6, no pain or bleeding; on the seventh, symptoms reappeared and patient was admitted to the hospital. Examination revealed tenderness in both abdominal quadrants; a tender cervix; vaginal bleeding and tender mass in the right lower quadrant. A diagnosis of ectopic gestation was made and operation performed on the 8th. The curettings and tube are reported as follows:

(a) *Tube*—The organ is enlarged in both its diameters and is 15 cm. long and 8 cm. wide. The uterine end presents a circumscribed enlargement, 25 mm. long and 10 mm. wide; the remainder of the tube is regular and symmetrical. The enlargement is the result of interstitial implantation of an ectopic gestation. A rent in its antero-inferior aspect has resulted in bleeding into the broad ligament, as well as into the peritoneal cavity. On gross cut section through this zone, the enlargement is seen to be the result of distention of the lumen by blood clot; the tubal wall proper, except in its inferior aspect, is thin, atrophic and hemorrhagic. Even with the naked eye the placental villi can be seen lodging in the tube wall. At the distal extremity the lumen is dilated and filled with blood, but except for edema the muscle wall is normal. Section through the ampulla and infundibulum shows a thickened mucosa with prominent folds. The tube lumen is free from blood; the fimbriae are almost completely retracted, just the tips projecting beyond the almost completely occluded abdominal ostium.

Microscopic Examination—Section through the anlage of the ectopic gestation reveals a tube lumen filled with clot and chorionic villi, only few are well preserved; most have lost their lining epithelial cells and the connective tissue stroma has undergone necrosis leaving a granular mucoid mass to mark the site.

Even where Langhans' and syneytial layers are retained the stroma shows mucoid degeneration. The inner tube wall has been destroyed and replaced by blood, fibrin and leucocytes. No traces of mucosa are present. Chorionic villi can be traced to the muscularis, and at the site of contact extensive fibrinoid degeneration has followed. Anteriorly and superiorly the wall is represented by a few edematous strands of muscle tissue in a state of hydropic degeneration with round cells; blood and neutrophils in the interstices. Posteriorly, the wall is fairly well retained and seems thicker than usually encountered in the tube, confirming the gross diagnosis of a true interstitial pregnancy. Here too, however, the muscle is edematous. More distally through the site of implantation the lumen is better defined, but filled with blood clots and degenerated villi. The mucosa is lacking, and even here, the superficial muscle layers are hemorrhagic. The tube wall is edematous and atrophic. In the infundibular region, the lumen is narrowed by large, widely arborizing mucous folds lined by hypertrophic epithelial cells and supported by a dense, sclerotic stroma. The muscularis, even here, is edematous. A moderate number of lymphocytes are present between the fibers. The blood vessels are engorged but reach maximum size in the serosa. Here the exudation of round cells is most marked, and about the blood vessels is very compact. These changes are indicative of a subacute inflammatory salpingitis of an interstitial type. No decidual reaction was found on serial section.

(b) *Curettings*—These are abundant, the fragments are large and thickened, reaching 4 mm., 6 cm. in thickness; the surface cell lining is lacking in all fragments. The gland tubules are normal in number but moderately increased in size; their shape is round or oval, the lumen filled with secretion. The lining cells are irregular and ragged against the lumen; though the cell *per se* is hypertrophic and holds a large oval nucleus basally placed, the stroma is compact. The cells are enlarged, round or oval in shape with abundant acid cytoplasm and a vesicular nucleus. About the blood vessels these reach sufficient size and are still

well enough preserved to be considered as true decidual cells; elsewhere, the cells are smaller, polypoid or oval in shape with a pycnotic, small, solid nucleus (Fig. 2). In one zone, restoration to long spindle cells has occurred; many show mitotic figures. In general, the impression is that of regressing decidual cells. The

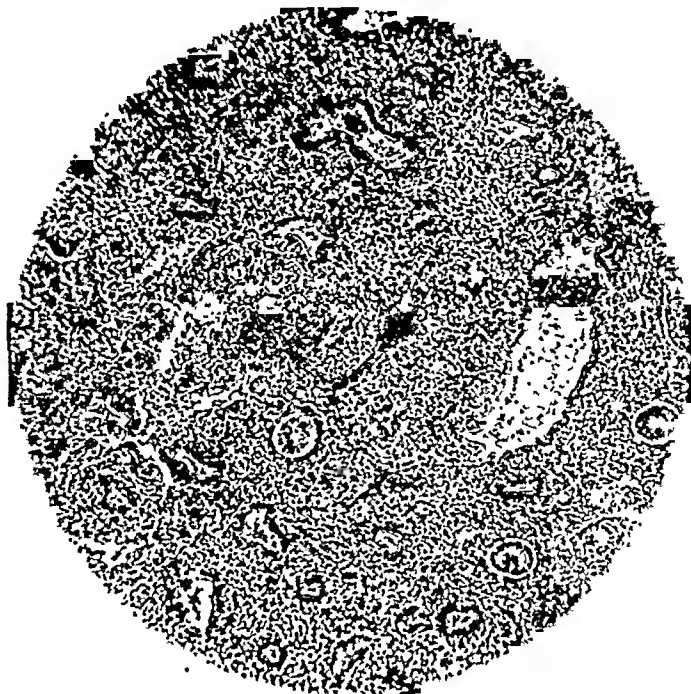


Fig. 2.—Case 2, (11,243) X20. Uterine curettings from case of ectopic gestation. The glands correspond to those of the internal mucosa, the capillaries are engorged and prominent, the stroma compact. Bleeding from the engorged vessels represents another mechanism of vaginal hemorrhage in ectopic gestation.

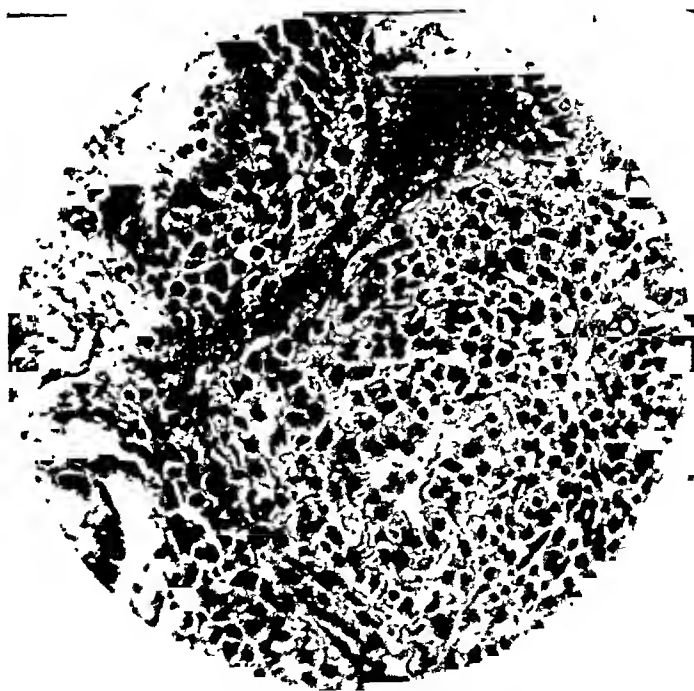


Fig. 3.—Case 2, (11,243) X80. Uterine curettings. The engorged capillary is prominent. The stroma cells are large, round, and prominent though the gland is of the internal type.

capillaries are numerous and engorged (Fig. 3). In some foci interstitial hemorrhage is present. An occasional lymphocyte is encountered. These features are well shown in the accompanying photomicrographs.

Summary.—In this case there is no clinical evidence of decidual separation and expulsion, yet curettage revealed a regressing decidua; unless specifically searched for, its occurrence would not have been suspected. In the absence of hemorrhagic changes in the mucosa and its failure of separation, it is fair to conclude that bleeding proceeded directly from the oval site in the interstitial portion of the tube, directly into the uterine cavity and then into the vagina. The receding decidua is in accordance with the advanced degeneration of the chorionic villi.

Clinically, ectopic tubes removed at operation demonstrate in 75 to 80 per cent of the cases, tubal abortions with a history of bleeding from weeks to months. Except for an occasional hemorrhagic mole the ovum has been detached from its site and lies either free in the tube or expelled with blood clot into the peritoneal cavity. In these "old dead ectopics" decidual separation and expulsion or regression must have been long past, yet bleeding per vagina persists until the tube is removed. Curettings in these instances cast considerable light on the mechanism of the bleeding as indicated by the next two cases.

CASE 3.—Mrs. M. R. was admitted complaining of persistent vaginal bleeding and pain in the right lower quadrant. Menstruation began at thirteen and recurred regularly every 28 days, three to four days in duration. Married five years. Normal labor four years ago. Not pregnant since. Last period from November 29 to December 2, 1923. On January 8 and 9, 1924, the patient began to spot and she noted shreds of soft grey material in the brownish discharge (probably decidual endometrium).

On the 14th, the bleeding became more profuse and was associated with right-sided pain. Pain and spotting persisted until admission on January 26. Prior to salpingectomy on 29th, a curettage was performed. The fragments are moderate in amount but glary and edematous. On microscopic examination the findings show a normal surface layer. The uterine glands are increased in size, and since cut transversely, are round or oval in shape. Inclusion forms are numerous; the lumens are filled with secretion or collections of hemolyzed red blood cells. The lining cells have tall nuclei which are enlarged and hyperchromatic. The cyclic phase is not typical. The stroma is markedly edematous and irregularly scattered throughout; in some foci preservation has been complete. The capillaries are engorged; several running perpendicularly to the surface have assumed the proportions of actual sinuses. On laparotomy the right tube was found converted into a typical hemotocoele. The right ovary contained the regressing corpus luteum. Serial sections of the tube failed to reveal the presence of decidua. The microscopic findings show the usual clot within the lumen with compression of the mucous folds, edema and atrophy of the muscularis. Only in the ampullar region are few well preserved chorionic villi encountered lying free in the lumen. The interstitial hemorrhage in the muscularis confined to the same tubal zone most likely indicates oval implantation in this zone. No other changes are noteworthy.

CASE 4.—Mrs. F. W. began her menstrual life at thirteen. Periods occurred regularly every 28 days and continued three days. There was no change after

marriage or previous to childbirth. The last period continued from September 28, to October 1, 1923. On October 28, menses recurred and continued very profusely with clots for two weeks. The next two weeks bleeding continued with daily spotting. On November 28, the bleeding recurred freely and was associated with pain in the right lower quadrant. Pain and spotting continued until admission on Dec. 11. Operation was performed on December 13. Curettage preceded right salpingectomy. The microscopic features are as follows:

The surface lining cells present no abnormality. The tubules are not sharply defined to a zone, though a basal layer of unaltered glands in a spindle stroma can be differentiated. The tubules are normal in size; round, or oval, or slightly tufted; occasional inclusion forms are seen. The lining cell is tall with abundant cytoplasm and a basally placed oval nucleus. The cell border is sharply defined against the lumen which in nearly every instance contains red blood cells. The

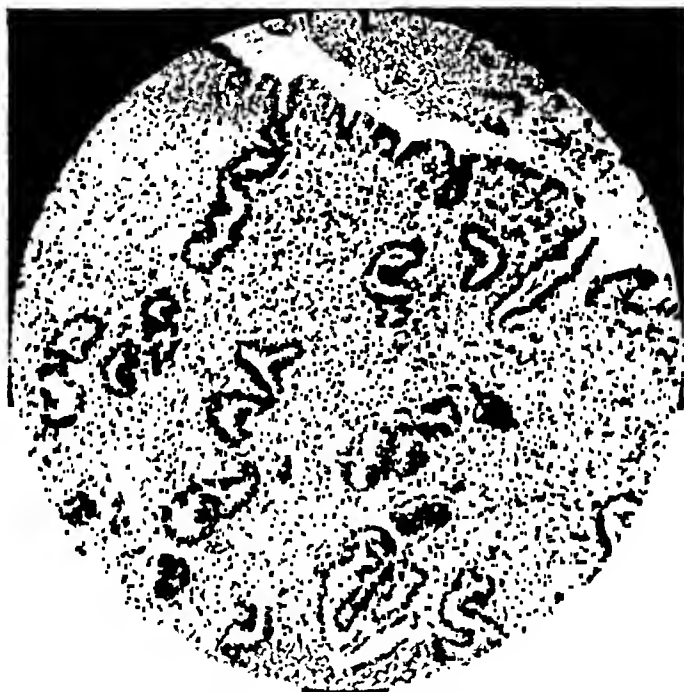


Fig. 4.—Case 4. (10.883) X60. Uterine curettings from ectopic pregnancy. The glands correspond to the late interval type. The stroma is diffusely infiltrated with red blood cells.

stroma has been converted from a spindle to the round cell form, but no decidual elements are present.

Throughout interstitial hemorrhage is present and near the surface is dense and compact, reminding one of a premenstrual mucosa though the gland contour is not typical of this phase (Fig. 4).

The right tube shows a dead ectopic, projecting from the abdominal ostium. The isthmus portion is normal.

On multiple gross sections the ampular and infundibular areas are found filled with clots which could be easily shelled from the dilated tube. Serial sections of the tube fail to show presence of decidual cells. The clot in the tube lumen contains well preserved chorionic villi. The mucosal papillae are flattened in the long axis of the tube. The lining cells are normal but the stroma contains engorged vessels. The muscle coat is thin and edematous. The serosa is normal but the blood vessels are congested.

In the last two cases, only an occasional villus is found in the tube even after serial section study. In keeping with complete ovular separation, no decidua is found in the uterus. The uterus is clothed by an interval type of endometrium with marked interstitial hemorrhage and markedly engorged vessels.

The injection experiments of Sampson on uteri with associated ectopic gestation demonstrated the passage of the injection medium from the capillaries to the uterine cavity.

The microscopic features in these cases are in keeping with his experiments. Subinvolution of the uterus persists until the ectopic has been removed.

This study has shown:

(a) Majority of tubal pregnancies are incomplete tubal abortions which are not completely terminated at the time bleeding occurs; and that vaginal bleeding persists as long as the ovum is alive and partially attached to its tubal bed.

(b) That many cases are operated before the ovum dies. In these, decidual reaction is found in tube and uterus.

(c) In those operated after death of the ovum, no decidual reaction is found.

On opening the abdomen in cases of unruptured pregnancy it is not uncommon to find blood escaping from the free end of the tube into the culdesac of Douglas; and in some of our cases, where erosion has caused porosity of the tubal wall, we have found blood escaping through the tubal wall, and yet, at this time, there had been no bleeding from the uterus.

On the other hand, in cases where we have removed the tube, hardened and sectioned it, and have found the ovum separated from its bed by blood clot, there has always been uterine hemorrhage.

We, therefore, must conclude from this clinical observation: that uterine hemorrhage is a sign of threatened tubal abortion; that many of these cases are operated upon before the abortion is terminated; and that, therefore, there are islands of decidua in the uterus which must be separated and cast off. This explains the persistence of uterine hemorrhage which continued after the tube with its contained pregnancy was removed.

In the microscopic study of the curettings we find decidual reaction in the uterus, as long as the ovum in the tube is alive, and the pregnancy is not terminated either by the removal of the tube, or the death or expulsion of the ovum.

In the majority of cases of tubal abortions, however, the endometrium shows nothing but a hemorrhagic interval mucosa; the bleeding, however, continues in about a third of the cases until the tube with its contained pregnancy is removed and the uterus gradually

undergoes involution. The tube, in these cases, when examined microscopically, shows an absence of decidual reaction, evidencing fetal death.

We feel, therefore, that it is safe to state that vaginal bleeding in the early phase of ectopic is the result of the death of the ovum. The bleeding proceeds in this instance from the endometrium as a result of the separation of the decidual cast, and, because of the erratic distribution of the decidual reaction in many cases, persists for days after the ovum dies or is removed.

(a) Many times decidual reaction in the uterus of ectopic occurs when not suspected. Routine curettage will show its true incidence of frequency.

(b) In interstitial pregnancy, vaginal bleeding may be due to the direct entrance of blood from the tube into the uterine cavity.

(c) The bleeding, if the tubal abortion is incomplete, is a result of persistent engorgement of the restored endometrium in which interstitial hemorrhage occurs with resulting vaginal bleeding following rupture of the dilated vessels.

Some few cases in which the bleeding persisted for a considerable period after the ectopic had been removed, were curetted and the curettings examined. In these, nothing was shown except the hemorrhagic interval mucosa, hence we believe that uterine involution is slower after ectopic pregnancy than after intrauterine gestation.

A CLINICAL CONSIDERATION OF THE CONTRACTED PELVIS*

BY H. C. BURGESS, M.D., F.A.C.S., MONTREAL, CANADA

PRIVILEGED to attend for a number of years the routine work of a teaching maternity hospital, I have been greatly impressed by the importance of the contracted pelvis.

As one observes the emergency work of this kind that enters the hospital, the conclusion that forces itself upon one is, that the fatal result to the fetus and the injury to the maternal soft parts are not due so much to an operation technically badly performed, as to the selection of an ill-advised method of delivery.

If this conclusion is a correct one, it becomes highly necessary to ascertain why this condition exists, and I believe it arises from the complex classification of the pelvis employed at the present time, a classification that is rarely, if ever, grasped by the student during his college course, and never retained by the practitioner in after life as a working basis.

A study of the 1,935 cases of contracted pelvises that entered the Montreal Maternity during the years 1906-1923 inclusive, shows them to be divided into thirteen varieties.

A review of the records of these cases, however, based on a larger experience, shows that it is possible, with the exception of a few imported into this country from Central Europe, to subdivide them into four divisions.

The first is the generally contracted pelvis (Fig. 1). It is not a deformed pelvis in any particular. Proportionate to the rest of the body, it fails at times obstetrically, owing to the fetus attaining its paternal characteristics.

The second is the masculine type of pelvis (Fig. 2). Assuming that its features in early fetal life, as suggested by Fehling, possibly are a secondary sex change influenced by the endocrine system, one notes in adult life the prominent muscular attachments, the heart-shaped brim, the deep pelvic cavity, the subpubic angle, and the narrow bischial diameter.

The third group is the rachitic, or nutritional type (Fig. 3). The simplest variety is the flat pelvis, and from this we progress to a flaring of the iliac spines and a widening of the pelvic outlet. The more serious varieties give rise to marked pelvic contraction in one or more diameters, and often make impossible the normal birth of the fetus.

*Read by invitation at the Forty-ninth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 15-17, 1924.

The fourth group is the result of conditions usually without the true pelvis, and one notes the pelvic deformity caused by a tuberculous hip (Fig. 4), by caries of the vertebra (Fig. 5), or by a pelvic tumor (Fig. 6), etc.

A review of the last 13,158 patients that entered the Montreal Maternity and whose pelvic measurements were taken, shows that 1,935 had contracted pelves, and of these 622 were generally contracted, 509 were rachitic, 398 were masculine, and 18 were diseased.

It is not my intention to minimize the monumental work that has been accomplished by anatomists and obstetricians in the past on the various types of contracted pelvis, but from a clinical consideration a definite advance can be made if the differences (if any) between a

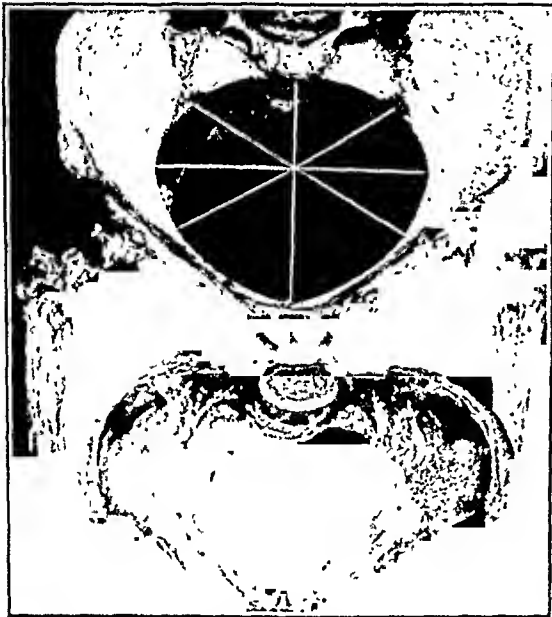


Fig. 1.—Normal pelvis (above). Generally contracted pelvis (below).

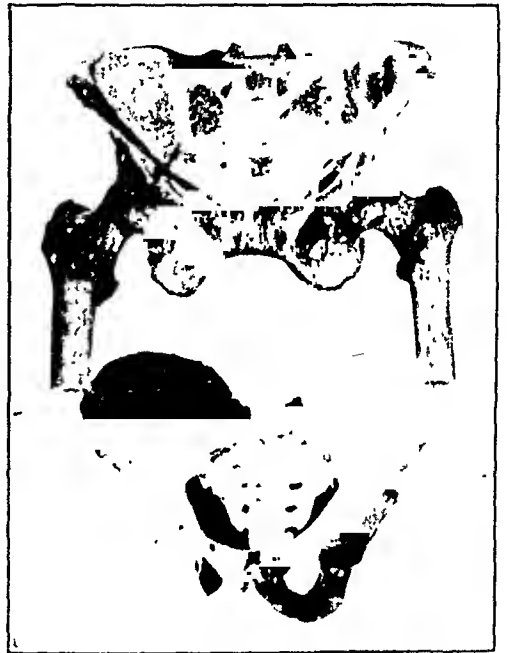


Fig. 2.—Normal pelvis (above). Masculine pelvis (below).

generally contracted and a justo-minor pelvis can be swept away, if it is admitted that a flat pelvis is always a rachitic one, and that funnel pelves are closely related to a masculine type. Especially is it an advance when one realizes that for the next quarter of a century at least, the great majority of obstetrical cases in this country will be attended by the general practitioner, and that better work will be done if he is shown that a simple classification such as I have given you, will meet his everyday wants.

While I would simplify the working knowledge necessary for a classification of the pelvis, I would urge that more time be spent in the discovery of this condition.

The more careful taking of the anamnesis, the better general phys-

ical examination, and the more detailed study of the pelvis, will all lessen the disastrous results at the end of pregnancy.

A careful inquiry into previous labors will give a very valuable index as to the probable course of labor in the succeeding ones.

If her labors have been easy or terminated by natural methods, the probability is that this woman's pelvis is large enough to allow the safe journey of another passenger through the tunnel, always remem-

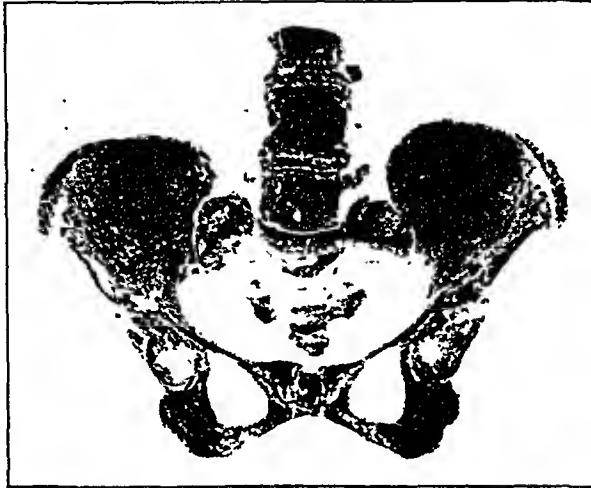


Fig. 3.—Rachitic pelvis.

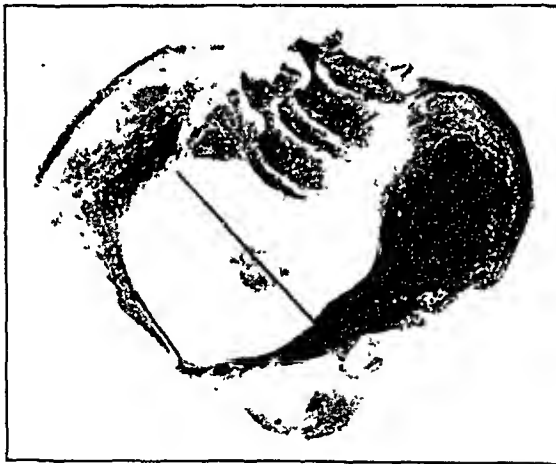


Fig. 4.—Deformed pelvis from hip-joint disease.

bering that with each succeeding pregnancy the 'passenger will be a little more bulky, and a little more tardy in undertaking the journey.

If, on the other hand, the labor has been difficult, protracted, or delivery has been instrumental, it is our duty to discover the cause and take precautions before the next labor takes place.

The early history of the life of the individual will be of the greatest benefit; the age at which she first walked, the history of any severe illness or accident, the history of dystocia in any other member of her family, may all give us the clue to impending disaster, and so put us on our guard.

Need I mention the great value of a careful general physical examination? How often the generally contracted pelvis can be more than suspected by the woman's size, the delicate mold in which she has been cast. The presence of a large head, the rachitic rosary on her chest, the bow legs, the thickened extremities of her long bones,

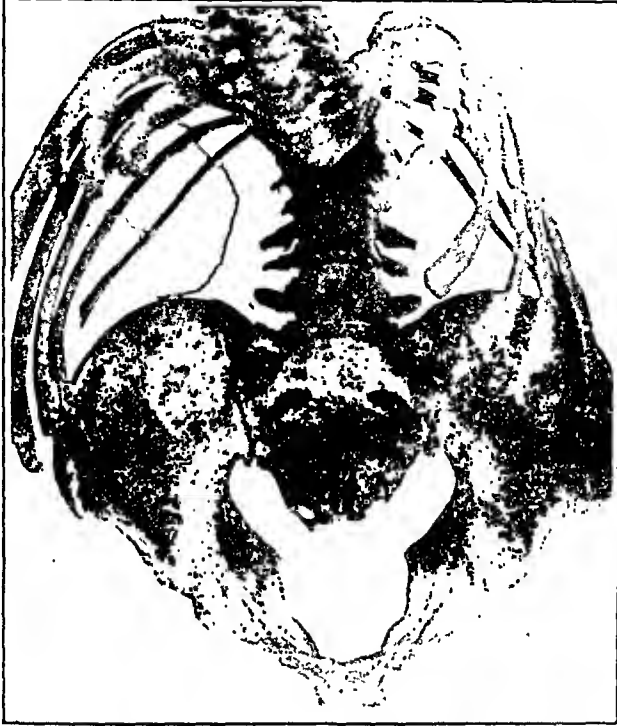


Fig. 5.—Deformed pelvis from spinal disease.



Fig. 6.—Bony tumor of pelvis.

may all give a clue to the rachitic pelvis; while the shoulders, the hips, the contour of her lower extremities, the orientation of the hair on her lower abdomen and thighs, spell the passing over of that individual from a female to a male type.

The third method of diagnosis depends on the examination of the patient, especially the primipara, in the last month of her pregnancy.

“Does the size of the uterus correspond to the period of amenorrhea?” is a question that should never be forgotten by an obstetrician. Almost of equal importance from an obstetrical point of view is an answer to the question, “In the primipara, has the head engaged in the last month of her pregnancy?”

If it is answered in the affirmative, it means that for that individual the worst part of her labor is over, and one can usually give her the assurance that her labor will be terminated satisfactorily. If, on the other hand, the head is not engaged, it means usually disproportion between the fetal head and the mother's pelvis and the examination must be carried a great deal further.

The formation of a pendulous abdomen means a failure of the head to enter the pelvis and clinically is of great diagnostic value.

After having ascertained the presentation and position of the fetus and estimated its size, we next turn our attention to the size and characteristics of the mother's pelvis, and here certain measurements are of the greatest value, and when once understood are not difficult to take, or to interpret.

The measurements are divided into what are known as the external and internal measurements.

By the external measurements we measure the false pelvis and then calculate the size of the true pelvis.

The measurements taken are four in number: the intraspinous, intraacristal, intratrochanteric and the external conjugate or Baudeloeque diameter, and they measure in this order, 26, 29, 31, 21 cm.

Personally I attach the greatest importance to these measurements, and I firmly believe there are very few occasions in the practice of medicine where one can argue as accurately as from these findings, yet probably no diagnostic help is ignored more completely.

In an effort to prove the value of these measurements, especially the external conjugate, we reviewed a series of two thousand cases, and found that where the external conjugate measured 20 cm. or over, one case in ten required operation, while if the Baudeloeque diameter was contracted down to 17 or 18 cm. the number of operated cases had advanced to the proportion of 1-3.75 (Chart I). If the pelvis is contracted and further study is desirable, the patient is put in the lithotomy position and the diagonal conjugate is measured; then by subtracting 1.5 or 2 cm. the true conjugate can be estimated.

A review of 2,000 cases at the Montreal Maternity shows that in 1,881 cases where the C.V. was 10.5 cm. or over, all cases delivered themselves spontaneously, while if between 8.5-7.5 cm. then one case in three demanded surgical interference.

From a study of these cases one can safely say that where there is a shortening of the true conjugate, there is practically always a shortening of the external conjugate, but there may be a shortening of the

CHART I
THE MONTREAL MATERNITY HOSPITAL
SERIES OF 2,000 CASES.

EXT. CONJ.	NO. OF CASES	DELIV. SPONTA- NEOUSLY	NO. TREATED	FOR- CEPS	V. & E.	CES.	CRAN.	IND.	RESULTS	
									MATER.	FETAL.
20	1449	1312	137	87	30	10	6	4	1	32
19.5-18.5	437	388	49	35	8	4	0	2	0	9
18 -17	112	82	30	17	2	2	0	9	0	14
16.5	2	2	0							
TRUE CONJ.										
10.5	1881	1881	0							
10 - 9	99	85	14	6	6	0	0	2	0	5
8.5- 7.5	20	12	8	2	0	6	0	0	0	0

external conjugate and no corresponding diminution in the true conjugate.

The attempt to engage the head while the examining finger is still in the vagina will give very valuable information as to the passage of the head through the pelvis, and in the Montreal Maternity we have confirmed over and over again the great value of this maneuver, when practiced under an anesthetic—a method which should never be neglected in borderline cases when labor by *vias naturales* is to be permitted.

After we have completed the detailed study of the pelvis, the problem is still before us as to the delivery of the individual, and before formulating rules for this procedure, I would like to review the work that has been done in the Montreal Maternity.

A study of Chart II shows that, of the 18,670 cases that were delivered, 1,935 showed a contraction of the pelvis.

CHART II
THE MONTREAL MATERNITY HOSPITAL
1906 - 1923

No. of Patients delivered.....	18670
“ “ Pelves measured.....	13158
“ “ Pelves showing contraction.....	1935
“ “ Patients with contracted pelvis delivered spontaneously.....	1462
“ “ Patients requiring operation.....	473

OPERATIONS

TYPE OF PELVIS	NO. TREATED	FORCEPS	IND.	CES.	CRAN.	IND.	MATER- NAL	FETAL
G.C.	173	60	25	40	12	36	2	35
Rac.	182	52	37	53	13	27	4	44
Mas.	106	73	6	14	5	7	2	20
Dis.	12	1	0	10	1	0	0	2
	473	186	68	117	31	70		
Results								
	Maternal	2	1	5	0	0	8	
	Fetal	31	21	7	31	11		101

Of these 1,935 cases, 1,462, or 75.5 per cent, delivered themselves spontaneously, leaving 473, or 24.5 per cent, requiring some operative procedure. A further study of these 473 cases shows that 186 were delivered by forceps with two maternal deaths (1 cardiac, 1 sepsis), while 31 infants, or 16.6 per cent, perished during their stay in the hospital. Version and extraction accounted for 68 cases, with one maternal death from hemorrhage, but with the loss of 21 infants, or 30.8 per cent. Cesarean section was performed 117 times for cases of contracted pelvis, with the loss of five mothers (three septic, one cardiac, one sarcoma); seven babies perished. Craniotomy proved an absolutely safe operation for the mother, there being no maternal deaths in our series of 31 cases.

Labor was induced in 70 cases with the very gratifying result that no maternal deaths followed, while the loss of eleven infants (15.6 per cent) is lower than in any other method of vaginal delivery.

A study of the chart in the opposite direction gives the results obtained in all cases of contracted pelvis, which had previously been divided into the four groups, and there is a remarkable similarity between the number of cases, the number requiring operation and the fetal death rate.

A summary of this work shows:

- (a) The large percentage of cases that delivered themselves normally.
- (b) The high fetal death rate in version and extraction.
- (c) The comparative safety of cesarean section, especially if made an elective operation.
- (d) That craniotomy should be safe for the mother.
- (e) That a timely induction of labor gives results that compare favorably with other methods of delivery.

Based upon these findings it would appear to me that certain definite rules might with advantage be formulated regarding the treatment of the cases with contracted pelves, and by referring to Chart III it will be seen that I have divided them into three groups depending whether the conjugata vera is 7.5 cm. or under, 9 cm. or over, or between 7.5 and 9 cm.

If the conjugata vera measures 7.5 cm. or less, and the patient is seen during her pregnancy, or early in labor, no one will question that under appropriate conditions, a cesarean section gives the best chance for mother and child.

If, however, the patient is seen in labor, the membranes ruptured, and attempts at delivery have been made, the problem is not so simple and requires the exercise of courageous judgment.

Realizing the great advance that has been made in utilizing the

CHART III

	Seen during pregnancy—cesarean section.
	“ “ labor, non-infected, cesarean section
	“ “ “ infected, attempt at forceps and craniotomy.
7.5 cm. or less	“ “ “ fetus dead—craniotomy.
	Less than 5 cm. always do cesarean section, or Porro cesarean if infected.
9 cm. to 10 cm.	Test of labor.
	Test of labor.
	“ “ “ plus Walcher position.
	“ “ “ “ “ “ plus forceps.
	“ “ “ “ “ “ “ “ plus craniotomy.
7.5 cm. to 9 cm.	<div> <div>Cesarean Section</div> <div> <div>Elective</div> <div>After test of labor without examination.</div> </div> </div>
	Test of labor and pubiotomy and forceps.
	Version and Extraction.
	Induction of labor after careful repeated examinations.

low cervical cesarean section, but refusing to believe that it is a panacea, I have formulated for my guidance the following rules:

(a) If instrumental delivery has been attempted, a craniotomy is advised, partly on account of the danger of infection, partly fearing facial or intracranial injury of the fetus.

(b) If the patient is frankly infected, as shown by foul-smelling discharge, etc., a fetal destructive operation is urged.

(c) When the patient is seen in labor with amniotic fluid draining for a period of fourteen hours; with a history of three vaginal examinations made through a field that shows no evidence of surgical cleanliness, my advice is a craniotomy.

(d) In all other cases I am willing to advise some form of cesarean section, perhaps a Porro if previous children are living, perhaps a low cervical cesarean following the technic as advised in the excellent monographs of some European and American gynecologists.

With a true conjugate over 9 cm., better results will be obtained by noninterference, or at least by giving the patient an opportunity to try to deliver herself. I find, however, that there is a great divergence of opinion as to what constitutes a test of labor in these cases. I have always kept in mind the definition laid down by the late Dr. J. C. Cameron of McGill University, which was as follows, "With the cervix fully dilated and membranes ruptured, with recurring pains every four or five minutes for a period of two hours, only then has there been a test of labor." How often a diagnosis of serious dystocia is made long before these requirements have been fulfilled. The employment of the Walcher position to assist the test of labor we have found of the greatest benefit, and frequently one sees the fetal head begin to descend through the brim following a tilting of

the patient's pelvis caused by the nurse's elevating the patient's buttocks for the use of the bed pan.

Cesarean section will always hold a prominent place in the solution of these cases, and if made an elective operation, or after a test of labor without pelvic examination, it is a safe and sane operation.

In Montreal pubiotomy has not been practiced to any great extent, but in combination with forceps, or as a prophylactic measure in breech extraction, it has, in a large obstetrical center, some merit.

A timely induction of labor will undoubtedly always hold its place in the treatment of this class of cases, not as a measure to bring puny undersized infants into the world, but as an operation to lessen the maternal morbidity and mortality.

In closing, may I call attention to the fact that during the great war those operating at the casualty clearing stations were aided very materially by suggestions that were communicated to them by the consultants of the various armies as to the methods that were giving the best results in certain surgical conditions? These suggestions were changed from time to time, and gave valuable aid to the proper surgical treatment of our soldiers.

The American College of Surgeons in their hospital standardization scheme are beginning to lay down the equipment needed, and indicating the line of treatment to be followed in certain conditions, and it seems to me that this is an opportune time to set our obstetrical house in order, and I am sure that a definite advance could be made by adopting for our students a simpler classification of the pelvis; if men already in practice could be taught the great benefits to be derived from a prenatal examination, and from a careful measurement of the pelvis.

A still further advance could be made if some unanimity of opinion could be arrived at regarding the proper treatment of mildly infected cases, suffering with pelvic dystocia and requiring delivery, and if this concerted opinion could be sent to the various obstetrical centers of America.

118 CRESCENT STREET.

(For discussion see page 787.)

THE CAUSE AND PREVENTION OF POSTOPERATIVE GAS PAINS*

BY CHAS. D. O'KEEFE, A.B., M.D., ST. LOUIS, MO.

(From the Gynecological Service of Barnes Hospital)

THIS is an old subject upon which much has been written; in fact so many routines have been proposed that one is only in a quandary after reading the extensive literature. All writers have agreed upon the prevalence of gas pains following abdominal operations, and the discomfort to which the patients are subjected. However, where some were convinced that the preoperative preparation was of all importance, others have laid great stress upon the operative and postoperative care. The lack of harmony in the treatment from the preparation through the postoperative course is indeed striking.

A study of this problem was begun in 1919 and continued through the following three years of clinical observation on the cases tabulated in this paper. Our routine at the beginning of this study was as follows: Purgation with castor oil at 4 P.M. the day before, with a soap-suds enema on the morning of the operation. Breakfast was omitted on the day of the operation, with a light lunch and dinner the preceding day. The preoperative sedative consisted of morphia and atropine. For abdominal cases the postoperative care was Murphy drip proctoclysis with glucose 3 per cent and soda bicarbonate 2 per cent, 200 c.c. of each, every four hours during the first day, and every eight hours the second day. Liquids by mouth were given after nausea had ceased, which usually meant quite a delay because of the persistent nausea and vomiting, which in turn often resulted in a continuation of the proctoclysis beyond the forty-eight hour period.

Under the above routine gas pains were indeed prevalent and their treatment was almost a daily problem. This frequency led us to believe that there was something radically wrong in our pre- or postoperative care, as all of the operations were done by a staff using, as nearly as possible, the same technic.

Our first step was to discontinue castor oil in the preparation and substitute a soap-suds enema. Later postoperative rectal injections were discontinued, followed by various series receiving saline as Murphy drip proctoclysis, saline as a single retained enema, glucose and soda bicarbonate as a retained enema and saline as a retained enema, immediately after the operation and repeated twelve and twenty-four hours later.

*Read before the St. Louis Gynecological Society, April 12, 1924.

The following charts show the number of abdominal cases studied and the percentage of gas pains in each series. Gas pains are distinguished by the presence of repeated vomiting in the postether stage, accompanied by abdominal distress and distention.

TABLE I
CASES RECEIVING GLUCOSE 3 PER CENT AND SODA BICARBONATE 2 PER CENT

TREATMENT	NO. OF CASES	MORPHIA-HYOSGIN IN PREPARATION	LAVAGED	AVERAGE AMT. ETHER IN OZ.	GAS PAINS NO. OF CASES	GAS PAINS PER CENT
Glucose and soda bicarb. by Murphy drip	18	2	7	7.3 (9 cases)	6	33.3
Glucose and soda bicarb. as single retained enema	20	15	16	7.5 (14 cases)	6	30.
Glucose and soda bicarb. by Murphy drip with castor oil in preparation	24	0	0	6.5 (18 cases)	15	62.5
TOTALS	62	17	23	7.01	27	43.8

Table I shows a total of 43.8 per cent gas pains for glucose per rectum. When castor oil was given in the preparation the percentage increased to 62.5 per cent. The Murphy drip proctoeclysis resulted in a higher percentage of gas pains than did the single amount of glucose and bicarbonate as a retained enema.

TABLE II
CASES RECEIVING NOTHING PER RECTUM, WITH CASTOR OIL OMITTED IN THE PREPARATION

TREATMENT	NO. OF CASES	MORPHIA-HYOSGIN	LAVAGED	AVERAGE AMT. ETHER IN OZ.	GAS PAINS NUMBER	GAS PAINS PER CENT
Castor oil omitted Nothing per rectum	23	0	0	6.9	6	25.6

Twenty-five and six-tenths per cent gas pains resulted. One case had severe bleeding from the cervical stump following a supravaginal hysterectomy and undoubtedly would have had gas pains regardless of the pre- or postoperative treatment.

This series resulted in 16.6 per cent gas pains with only 9.6 per cent from repeated enemata. The 33.3 per cent gas pains with the Murphy drip is higher than would be expected, but probably would be less over a greater number of cases.

An attempt was made to run a series of rectal feedings with glucose and soda bicarbonate by the Murphy drip method following

TABLE III

CASES RECEIVING NORMAL SALINE PER RECTUM, WITH THE METHOD USED.
No CASTOR OIL.

TREATMENT	NO. OF CASES	AMOUNT OF ETHER IN OZ.	MORPHIA-HYOSCIN	LAVAGED	GAS PAINS NUMBER	GAS PAINS PER CENT
Saline as Murphy drip	6	11 (2 cases)	1	0	2	33.3
Saline as retained enema (Not repeated)	59	8.5 (48 cases)	19	9	11	18.5
Saline— 750 stat. 300 in 12 hr. 300 in 24 hr.	31	5.6 (26 cases)	31	1	3	9.6
Totals	96	8.6 (76 cases)	51	10	16	16.6

minor vaginal operations. However, the objections of the patients were so foreeful that only one case received the feedings over the full forty-eight hour period. This case, a dilatation and curettage, had considerable nausea with some vomiting, but no abdominal distention. The patient complained bitterly because of the presence of the rectal tube and had marked mental unrest. Two interposition operations received Murphy drip proctoclysis, one glucose and soda bicarbonate and the other saline. Both vomited and had considerable pain; however, there was no distention.

Through the courtesy of the Obstetrical Department, the results following cesarean section are given.

TABLE IV

CESAREAN SECTIONS

TREATMENT	METHOD GIVEN	NO. OF CASES	LAVAGED	GAS PAINS NUMBER	GAS PAINS PER CENT
Glucose 3 per cent	Murphy drip	2	0	2	100
Soda-bicarb. 2 per cent					
Saline	Murphy drip	1	0	0	
	As single enema	3	0	3	100
Nothing per rectum		4	0	2	50
Total		10	0	7	70

The majority of these cases were scheduled and received the usual preoperative enemata without castor oil. Atropine gr. $\frac{1}{50}$ was given, morphia being omitted. The amount of ether was not recorded in enough cases to approximate an average.

The cesarean sections are only mentioned in order to show the prevalence of postoperative gas pains, regardless of the pre- or postoperative treatment. This, no doubt, can be attributed to the intestinal irritation that is set up through the spilling of the uterine contents, the direct trauma to the pelvic and abdominal organs and perhaps

to the relief of abdominal pressure. The high percentage of gas pains with stormy postoperative courses, shows that cesarean section should be held strictly to its indications and not taken so lightly by the surgical enthusiasts.

No attempt has been made to compare the effect of ether, morphia-hyoscin and postanesthetic lavage on gas pains as figured on a percentage basis. However, their importance as contributing factors will be referred to later.

From the study of the cases tabulated it is quite apparent that the preoperative, operative and postoperative care are all important in the end result of every case. A few years ago it was universally customary to starve and purge the patients before operation. Oschner,¹ as late as 1918, strongly recommended purgation 12-24 hours before operation followed by a diet of broth. Harbin² stated that a laxative lessens the gaseous contents of the intestinal tract. Shier³ condemns purgation the night before, but recommends a mild cathartic two days prior to the operation. Moynihan⁴ also precedes his operations with cathartics and even goes so far as to give sterilized liquids by mouth. In contrast with these recommendations we find many men strongly opposed to cathartics in any form. Peet⁵ advocates only enemata and states that purgation results in psychic and physical unrest, loss of sleep, loss of body and intestinal fluids, hypotonicity of the intestinal walls and a change in the intestinal flora resulting in a preponderance of the fermentation organisms. Alvarez and Taylor⁶ have shown a disturbance of the mesenteric circulation with a break in intestinal rhythm following cathartics. In addition, Alvarez⁷ has shown that isolated segments of rabbit intestines give weak and irregular contractions in Ringer's solution, following a laxative, while they respond with irregular rhythm following castor oil. He also points out that the intestines empty in 7-9 hours, following which time the colon alone contains waste products and if not spontaneously evacuated can be easily and thoroughly cleansed by an enema on the morning of the operation.

If the small intestine empties itself in nine hours, it is not only useless to purge 24 to 48 hours before the operation, but it is unnecessary to use cathartics at any time in the preoperative preparation. It is likewise wrong to withhold food from the patient except immediately before the operation. At present, it is our custom to omit breakfast for an early morning operation, but a regular diet is allowed the day preceding. A free intake of water is encouraged up until within one hour of the operation.

From the clinical study, gas pains resulted in 62.5 per cent when castor oil preceded the operation and in 33.3 per cent when it was omitted. Murphy drip proctoclysis of glucose and soda bicarbonate

was used in each series and, as will be shown later, accounted for the high percentage of gas pains.

During the operation trauma is the important factor to be considered. Long drawn out operations are closely associated with stormy postoperative courses. This is due to direct trauma, indirect trauma through long exposure, or to ether saturation. Quick, neat work is to be encouraged, but care should never be sacrificed for speed. There are many men who will strive for a fifteen minute appendectomy or needlessly hurry through a cesarean section and yet these same men will take two to four hours to perform other pelvic work in a very leisurely manner.

We have all witnessed operations where the intestines have been carelessly packed and a loop allowed to be compressed against the abdominal wall or even allowed to rest outside the incision. Again we have seen a loop of intestine actually pinched and held for many minutes by a retractor.

Bissell⁸ has offered his rubber pads as a means of lessening trauma and claims a 50 per cent reduction of postoperative vomiting through this method, due to a decrease in intestinal irritation. He does not state whether moist or dry gauze was used in his cheeks. Although his 50 per cent reduction in postoperative vomiting is indeed striking, I cannot concur with his views as to the importance of this one method. His very obvious mistake seems to have been in his postoperative treatment; glucose and soda bicarbonate proctoclysis having been administered only to his cheeks. The most favorable aspect of the rubber pads seems to be due to their ability to hold back the intestines because of their own body resistance rather than by pressure through packing, as is found with the use of gauze. A nonirritating packing certainly has its advantages. However, the rubber pads, due to their nonabsorbing qualities, allow the pelvis and abdomen to fill up with blood and debris, which eventually have to be cleansed by sponges. H. S. Crossen, chief of our staff, uses a modified rubber apron to pack off the intestines and thinks favorably of the method. No attempt is made in this paper to compare the results of the different methods. However, it must be remembered that the packing back of the abdominal contents in a pelvic operation is an art in itself, although appreciated and cultivated by very few operators.

If a loop of intestine is compressed over a long period of time, either by packing or a retractor, it becomes at least partially paralyzed through impairment of its blood and nerve supply. This portion loses its ability to respond to normal physiologic action, the most important of which is rhythmic peristalsis and gaseous exchange. All peristaltic waves will end or be reversed at this point and normal gases that would ordinarily be taken care of by absorption through the blood or expulsion through the intestinal tract will have their

origin and accumulation at this point. Distention results because of muscular atony due to impaired innervation. No pre- or postoperative treatment can atone for this injury and gas pains are inevitable. It is the duty then of every surgeon, not only to do justice to the existing pathology, but to respect adjacent structures in order to provide a humane postoperative course for his patient.

Next comes the question of postoperative treatment and it is this phase of the work which prompted this study. In all cases where ether is used—and it is still the universal anesthetic—there will be the so-called “ether stage.” We have reduced the amount of ether needed by the use of morphia and hyosein hydrobromide in the preoperative preparations.⁹ In addition gastric lavage is done during the closing steps of the operation. This is best done by means of warm saline solution and undoubtedly is of great value in cleansing the mucosa of the stomach of its ether saturation. The first washings are very high in ether content, the odor being quite pronounced.

I cannot agree with the majority of writers as to the importance of ether in the cause of gas pains. It is undoubtedly a contributing cause, but it certainly has a transitory effect. The amount of ether does not increase in proportion to the time of the operation. In other words, the number of anesthesia minutes per ounce of ether increases as the length of the operation increases.⁹ This is because of the large amount required to procure surgical anesthesia. The elimination of ether is very fast, and the twenty-four-hour ether stage that is so often mentioned is, in all probability, about twelve to sixteen hours too long. Ronzoni¹⁰ has shown that 100 c.c. of blood from a dog, following three hours and fifteen minutes of deep anesthesia, contained 135 mg. of ether, while only 10 mg. were present in 100 c.c. of blood two and a half hours later. The ether was practically eliminated at the end of one and a half hours, with a very large drop, 135 mg. to 50 mg., in the first fifteen minutes. If the ether is removed from the mucosa of the stomach and from the blood supply of the gastrointestinal tract, physiologic action should return almost immediately, unless retarded by some preoperative or operative trauma.

When the patient returns to her room there are three important things to be considered: Stimulation of the gastrointestinal tract, nourishment and rest. Stimulation may be carried out mechanically or by the use of drugs. There are many advocates of stimulation with drugs, such as quinine muriate, pituitrin, physostigmin, eserine sulphate, digitalis, etc. Some of these are recognized as valuable in the treatment of gas pains, but even here are questioned by a few writers. As for quinine muriate¹¹ and digitalis³ the results cannot be questioned, but there seems to be no scientific basis for their use. It must be remembered that for every drug stimulation there is an opposite and usually unequal reaction which by far offsets the pri-

mary stimulation. Mechanical stimulation, therefore, seems to be the method of choice. This is best carried out by small amounts of saline or water introduced into the intestinal tract. Water by mouth should be given as soon as possible, and much earlier than it is usually administered. If ordered after nausea has ceased, it will always be delayed too long. While waiting for consciousness and delayed intake per os, rectal stimulation should be instigated. Water or saline should be given in small amounts at frequent intervals; the exact amount and frequency are open questions. Intermittent stimulation gives the best results. Our best results were obtained by saline immediately following the operation and repeated twelve and twenty-four hours later, when only 9.6 per cent gas pains resulted. I believe that even better results could be obtained by decreasing the interval at least to every six hours during the first thirty-six hours. Murphy drip proctoelysis is mentioned only to be condemned. With this method overstimulation results; overdilatation usually takes place and the psychic effect on the patient is 100 per cent demoralizing.

Nutrient rectal feeding has its place in the treatment of certain diseases where the intestinal tract is capable of normal function, but it certainly has no place in postoperative treatment. In the first place the patient, in all probability, does not need nourishment, but if food were needed, the intestinal tract is in no condition to assimilate it. No one would insult the stomach with food at this time, yet the gastrointestinal tract below the stomach is a part of the same mechanism and is equally unable to handle food. If nourishment is imperative, it should be given intravenously for quick stimulation, or subcutaneously, if less urgent, but never by rectum until normal peristaltic waves have been reestablished.

The great majority of men give glucose per rectum with some sort of alkaline substance, in the belief that they are giving nourishment and combating acidosis at the same time. In the average case there is no acidosis impending, but if acidosis exists, it should be treated by intravenous alkaline solution, or given per rectum alone. The effect of the citrate or carbonate when given per rectum with glucose will, in all probability, be lost because of the acids liberated through the action of bacteria on the glucose.

At present the rate and amount of absorption of glucose by different parts of the intestinal tract is not quite clear. There seems to be no question concerning the absorption in the small intestine under normal conditions, but many have questioned the ability of the colon and the rectum to absorb it. Tallerman¹² has decided that there is an absorption per rectum, as determined by a rise in blood sugar. However, his patients were apparently not postoperative, and he used 33½ per cent solution, which, if not impracticable, is certainly not used by the average surgeon. Many men question the ability of

the gastrointestinal tract to absorb high percentages of glucose, and feel that it causes a marked irritation. Tallerman claimed no irritation from his 33½ per cent.

The most important point in the rectal feeding of carbohydrate is whether the nutritive effect is of enough value to offset the ill effects caused by the formation of gas and acids through the action of the intestinal bacteria on the nutritive media. If some absorption takes place before fermentation begins, the ill effects of the latter will follow and overshadow the beneficial results of the very few calories absorbed. We know that glucose in weak solutions is fermented by *B. coli* and when the coli are mixed with the intestinal contents glucose will be fermented in very much higher concentration. As the greatest number of bacteria are in the region of the ileocecal valve, it does not seem logical to introduce a gas-forming nutrient into this area. Fermentation will result in by-products such as hydrogen, carbon dioxide, lactic and acetic acid, etc., which will not only be of no value but will actually encourage acidosis and stasis.

The whole gastrointestinal tract at this time is in a state ranging from slight peristaltic waves to areas of complete stasis. Thus, the gas as formed will be forced up through the colon, through the ileocecal valve and follow along the lines of least resistance. At best the return to normal rhythmic peristaltic waves is delayed, the amount of distention and vomiting depending directly upon the trauma that has been established by the preoperative or operative care.

The advantage of saline per rectum over the glucose, as shown by the clinical cases, is certainly impressive. The reduction from 43.8 per cent gas pains to 16.6 per cent, other conditions remaining equal, certainly shows that fermentation must take place.

We do not refrain from giving morphia whenever the patient's discomfort warrants a sedative. Undoubtedly morphia retards peristalsis, but pain, fear and worry have a much greater effect toward stasis than the effects of morphia or codein. I believe that pain, fear, nervousness, etc., play a greater part in the cause of gas pains than does the effect of ether anesthesia. For this reason the nervous patient should have both pre- and postoperative sedatives. Taylor, Terry and Alvarez¹³ believe that the postoperative purge should also be discontinued. In this I agree; however, I do feel that simple enemata have a stimulating effect on peristalsis and that enemata or mild cathartics should always be given when the food intake has been sufficient to warrant a movement. Routine purgation on a given day will create more harm than good in a large number of cases. It is useless to purge an empty intestinal tract or one that contains waste products only in the colon or rectum. The ill effects of purgatives always stand out and are not in keeping with the quiet, uneventful postoperative course that is hoped for by all concerned.

In summarizing, the following conclusions are offered:

1. That regular diet may be given to within twelve hours of the operation.
2. That purgation is not only unnecessary but harmful.
3. That avoidable trauma to the abdominal contents during operation is too often the cause of postoperative gas pains.
4. That the ether effect may be alleviated by the preoperative use of morphia and hyoscin hydrobromide and the postanesthetic gastric lavage.
5. That peristaltic action should be stimulated immediately following operation; intermittent injections of saline or water being the method of choice. Drugs should be discouraged.
6. That postoperative nutrient rectal feeding predisposes to gas pains.
7. That the disadvantages of the Murphy drip proctoclysis outstrip the advantages.
8. That morphia should not be denied whenever the patient's discomfort demands it.
9. That pain, restlessness, sleeplessness and fear play an important part in the stasis of the gastrointestinal tract.

REFERENCES

- (1) Ill. Med. Jour., 1918, xxxiii, 20. (2) South. Med. Jour., 1914, xii, 702. (3) Surg. Gynec. and Obst., June, 1921, p. 559. (4) Moynihan: Textbook on Abdominal Surgery. (5) Jour. Am. Med. Assn., 1918, lxxi, 175. (6) Jour. Pharm. and Exper Therap., 1917, x, 365. (7) Surg. Gynec. and Obst., v, 1918, xxvi. (8) Surg. Gynec. and Obst., Sept., 1922, 320. (9) Jour. Mo. St. Med. Assn., 1923, xx, No. 4. (10) Jour. Biol. Chem., October, 1923. (11) South. Med. Jour., November, 1916, p. 988. (12) Quart. Jour. Med., 1919-1920, xii, 356. (13) Jour. Am. Med. Assn., 1922, lxxix, 1578.

WALL BUILDING.

THE CAUSATION AND TREATMENT OF RUPTURE OF THE UTERUS*

BY BARTON COOKE HIRST, M.D., PHILADELPHIA, PA.

THIS communication is a record of clinical experience in rupture of the uterus rather than a literary or statistical research. I find it necessary in reviewing my personal experience with the causes of rupture of the uterus, to divide the accident into ten separate classes, presenting one or two examples under each head.

1. Rupture of the uterus due to maternal obstruction: Contracted pelvis is usually thought to be the commonest cause, but in Koblanek's analysis of eighty cases, fetal obstruction was the cause more than twice as often as a contracted pelvis.

We have had a recent example in our out-patient service of a moderately contracted pelvis in a woman in labor for the fourth time, with a child that proved larger than the other three. She had been delivered before without special difficulty. After some eighteen hours of labor her pains suddenly ceased and there was a slight bloody discharge from the vagina with symptoms of shock. Unfortunately the practitioner in attendance apparently did not recognize the true nature of the case and there was some delay in procuring a consultant. Upon his arrival the case was transported to the University Hospital in the ambulance but there was a collision about a mile from the hospital with another motor car with the result that the woman was thrown onto the street. She was then taken to my hospital service in the lower part of the city and there operated on immediately. She died three days later of pneumonia apparently from exposure, but the postmortem examination showed that the peritoneum was perfectly healthy and that the uterine walls which were sutured instead of eradicating the uterus, had completely healed.

2. Fetal obstruction: Hydrocephalus, is the most important, as malposition and overgrowth are not so likely to be overlooked.

In the out-patient service we had a breech presentation which was delivered as far as the shoulder, but the practitioner then experiencing difficulty, a consultant was summoned who thought that enough strength had not been applied to the shoulders. Consequently he pulled much more vigorously with the result of rupturing the uterus its entire length and also rupturing a hydrocephalic head. I operated on the woman as soon as she arrived in the hospital, did a difficult hysterectomy under the most unfavorable conditions and fortunately she recovered.

3. Spontaneous: Rupture with or without a scar from a previous operation.

I have seen two cases of spontaneous rupture of the uterus in addition to those that are now unfortunately quite common following cesarean section. I regret to say that I have had one of these following my own operation, the only one as far as I know.

*Read at a meeting of the Obstetrical Society of Philadelphia, February 14, 1924.

The two cases of spontaneous rupture occurred in very fat women who had become suddenly obese just before their last pregnancy; there was no obstruction whatever in either case but the uterus ruptured extensively and the child was expelled into the peritoneal cavity.

One case was a transverse rupture of the fundus from tube to tube. I only saw the woman a month after her delivery and operated for what I supposed to be a pelvic abscess but found the uterus with a complete rupture through the fundus into the peritoneal cavity, walled off by peritoneal and intestinal adhesions. A hysterectomy fortunately, was satisfactory in this case.

4. Perforation from localized necrosis.

There was an interesting example in my service in the Philadelphia Hospital. A woman was delivered spontaneously without any suspicion of injury to her uterus, but when she got out of bed she suddenly discharged considerable quantities of clear fluid from the vagina. We naturally thought of an injury to the bladder but a careful examination showed that there was a round hole in the uterine wall corresponding with the promontory of the sacrum during labor and communicating with a limited portion of the peritoneal cavity in which there had been a secretion of ascitic fluid that was discharged through the orifice in the uterus from time to time with the patient in the erect posture.

5. Rupture by internal manipulation.

Unfortunately under this head a number of examples might be given, but two will suffice. In one, a physician attempting to control uterine hemorrhage at the fifth month ruptured the vaginal vault. He then succeeded in inserting his hand in the uterus whereupon he ruptured the fundus. When I saw the patient shortly afterward, I found the original operator with his hand and arm up to the elbow in the woman's abdominal cavity which he had opened with the instruments in his pocket case. He was holding on to the ruptured uterus with the idea he said, of controlling the hemorrhage.

In another case brought into the University Hospital, the uterus was completely ruptured, two pieces of intestine detached from the mesentery, were hanging out of the vulva and both the baby's arms had been pulled off in an attempt to do version, the arms, apparently, having been mistaken for the legs.

It is a commentary on the present fad for an immoderate resort to version that out of Koblack's eighty cases of rupture, twenty-nine or thirty-six per cent, were due to version.

6. Perforation by instruments through the vagina.

Under this head, too, numerous examples could be presented but I have chosen five out of a larger number.

In one, the uterus was perforated by an instrument inserted in the third month with the idea of emptying it. The small intestine was caught and was pulled on until the whole length of the small bowel was pulled out and then pulled off. In another case the uterus had been perforated by an instrument; the ileum, was caught just short of where it enters the caput coli, torn across, and then pulled back into the uterine cavity where it was firmly fixed, so that all the contents of the intestine except the large bowel oozed out of the external os uteri. I operated on this woman some twelve days after the original injury doing an intestinal anastomosis and a hysterectomy, but the woman was so toxic that she did not survive the operation.

In one of my hospital services an intern endeavoring to estimate the duration

of pregnancy in a partly completed abortion, perforated the uterus with a sound and I found omentum in the uterine cavity.

In another case in another hospital service, the intern perforated the uterus in an attempt to clean out an incomplete abortion and then gave the woman an intrauterine douche of bichloride of mercury. That was years ago when this antiseptic was generally employed, but instead of delivering the fluid into the uterine cavity, he passed his two-way catheter into the abdominal cavity and we recovered something like a quart of bichloride solution from the peritoneal cavity in the postmortem examination. In another case, in which a doctor had induced abortion on his wife, and then called in another physician to complete it, there was a rupture of the uterus by an instrument, with death shortly afterward, from peritonitis. The woman, when I saw her, was beyond aid.

In another case a patient had used a long handled buttonhook to induce abortion on herself. She perforated the uterus, twisted the buttonhook about in the peritoneal cavity, caught a loop of intestine in the hook and tore a hole in it. I was obliged to do an intestinal anastomosis and a hysterectomy, fortunately with a successful result.

7. Perforation of the uterus through the abdominal wall.

Under this head I have seen two rather remarkable examples.

In one, in the Maternity Hospital of Philadelphia, a young girl illegitimately pregnant, determined to destroy her fetus, so she passed a long hatpin into her abdomen at the umbilicus transfixing the fetus and accomplishing the result she desired. The fetus was born dead shortly afterward, but the woman suffered no ill consequence whatever, except for a few drops of pus which oozed out of the navel for two or three days.

In another case a girl attempted to commit suicide at the fifth month of pregnancy by shooting herself through the abdomen. She miscalculated the height of the fundus uteri, however, and placed the muzzle of the revolver just above the umbilicus. The bullet entered this point and emerged from her back. She made a perfectly spontaneous recovery and was delivered under my observation at term. This does not come under the head of a perforation of the uterus but was an attempt I think not only to commit suicide but to destroy the evidences of the girl's condition. At least that was the thought, I believe, in her mind.

8. Rupture of lower uterine segment in placenta previa treated by version.

There is a possibility of ruptured uterus in performing version for placenta previa no matter how carefully the operation may be performed. I once had an experience of this sort before a class of students, in which I treated a case of placenta previa in this manner; pointing out the danger of rapid extraction of the child; mentioning the possibility of rupture of the lower uterine segment on account of the alteration in its texture; waiting a considerable length of time after the performance of version before proceeding to extraction, at least an hour and three-quarters or two hours and then completing the operation with the utmost gentleness and care. I was chagrined to find a rupture of the lower uterine segment in which I could put my fist. The woman recovered with gauze pack and drainage.

9. Perforation of the vaginal vault.

I once saw an interesting example of perforation of the vaginal vault by forceps. The physician had attempted to apply forceps before any dilatation of the external os whatever, but with complete effacement of the cervix and great

distention of the lower uterine segment. Mistaking this portion of the uterus for the child's head, the blades of the forceps, which were inserted with a good deal of force had perforated the vaginal vault, then when traction was made, naturally the uterine wall itself was lacerated by the traction exerted on the lower uterine segment. When I saw this woman in consultation she was moribund and nothing could be done for her.

10. Partial rupture of peritoneal coat and superficial myometrium by imposition of weight on the abdomen.

Under this head I have seen a remarkable instance of rupture of the perimetrium and superficial portion of the uterine wall, without complete involvement of the myometrium and without entrance into the uterine cavity, but with death from profuse hemorrhage. This accident was due to coitus in the last month of pregnancy; the husband was a man of large stature and unusual weight; at least two hundred and fifty pounds. Curiously enough he had lost his first wife with the same symptoms at the same date of pregnancy and obviously I think, from the same cause.

The treatment of ruptured uterus must be adapted to the individual case. There is a choice of inactive treatment; irrigation and gauze drainage; gauze pack alone; and abdominal section, often with the necessity of intestinal anastomosis or closure of intestinal puncture.

I once had a remarkable case of complete recovery of ruptured uterus without any active treatment whatever. The woman refused the induction of labor which I first suggested; she then fell in labor which was obstructed by a rachitic pelvis. She refused a cesarean section which I urged on her; she stipulated that she might make an effort to deliver herself during the night and then if she did not succeed she would consent to the operation, but just before I arrived in the hospital the following morning, by one stupendous effort, she ruptured her uterus, expelled the baby at the same time, dead with a spoon-shaped depression in its skull. I then insisted on operation for the ruptured uterus but she flatly refused and curiously enough made a complete and satisfactory recovery without any treatment at all, having refused the correct advice I had given her on three separate occasions. Like everyone with much experience in obstetrics I have treated ruptured uterus by various plans: irrigation and gauze drainage through the vagina, with the rupture low down and posteriorly; hysterectomy a number of times; intestinal anastomosis in several of the cases; sewing the rent and peritonealizing it without attempting to remove the uterus and in some instances splinting the wound, if it was anterior, as Leopold suggested by pressing the uterus forward on itself by means of an extensive intra-pelvic tampon inserted from above, behind the uterus. There is no routine treatment for this condition, but the operator must use judgment and discretion and be guided by experience.

It is impossible for me to present a statistical account of my own

work of more than thirty years in a number of hospitals and in different localities. The best statistical study I know of which shows the results of various treatments, is that of Schultz, in which it appears that out of 323 cases of rupture of the uterus, the mortality of inactive treatment was 78.8 per cent; of irrigation and drainage 64 per cent and of the operative treatment 55.3 per cent.

1821 SPRUCE STREET.

(For discussion see page 804.)

A RARE CONGENITAL ANOMALY

BY HAROLD A. PECK, M.D., ALBANY, N. Y.

(Attending Obstetrician, Memorial Hospital)

THE association of hydrocephalus, spina bifida, and talipes in the same fetus is a rare finding as evidenced by a careful search of literature. Similar cases may have been seen but apparently not reported. There were two other cases found in the literature, comparable to the one which the writer wishes to report. Hydrocephalus alone is not so uncommon, about 1 in 1500 cases and spina bifida about 1 in 1000 cases.

ETIOLOGY

Edgar¹ says that "during the period of embryonal life, which is computed by various authors to be from 6 to 12 weeks, what is known as organogenesis occurs. During the remainder of intrauterine existence there is a little more than an increase in size, just as in extra-uterine life. It seems almost natural to suppose that disease in the embryo must be manifested rather by arrested development or perversion of organs than by ordinary pathologic alterations. A slight malformation of an embryonal organ must increase in size with the growth of the latter; in no other way could the occurrence of extensive malformations be explained. On the other hand, a few true deformities may arise during the fetal period because organogenesis, while nearly completed in the earlier weeks of gestation, goes on to a certain extent throughout intrauterine life and through many years of individual existence."

Regarding the time sequence of the structures which participate in the defect, normally the entire neural tube is closed at the end of the third week, and is the full length of the embryo. Also the vertebral neural arches from the first cervical to the third or fourth sacral are closed at the eleventh week, the arches below the fourth sacral are normally rudimentary. The defect, whether it be a failure of closure of the medullary groove or an adherence of the meningeal layers to the skin, cannot occur after the vertebral arches are closed and at this period of growth and indeed for a short time thereafter

(third month) the vertebral column and spinal cord are increasing, *pari passu*, so that each cord segment lies in line with the corresponding vertebral segment. However, should defect occur, the general development of the rest of the embryo may go on unaltered except by mere mechanical hindrance at the point of defect.²

Sharpe³ states that "the majority, if not all cases of spina bifida are caused by pressure of an excessive secretion of spinal fluid." The excessive secretion in hydrocephalus is well known.

Barnet⁴ points out times when accidents are most likely to occur in the osseous development of the spine. He says that "from the time that the differentiation of scleromatous cells begins, any pathologic factor may operate to produce any degree of defect."

The normal formation of the neural arch involving the medullary tube takes place by the growing, lateroposteriorly, of processes of scleromatous tissue from the primitive vertebrae. These processes, known as the "primitive bows," are destined to meet dorsally to form a closed membranous canal which is chondrified at the fourth month. In a case of lumbar spina bifida, where there is an absolute inhibition of the growth of the vertebral bows, the neuropathology resulting from the gross osseous defect of the neural canal makes talipes a sequence to spina bifida, as the feet continue to maintain their intra-uterine position.

We are still deeply ignorant of the manner in which monstrosities are produced. Studies of very early embryos which have perished from intrinsic causes or from affections of the membranes throw hardly any light on the genesis of these monsters.

Bailey and Miller⁵ say that "the earlier view that the deformity was due to an accumulation of fluid within the spinal canal in spina bifida is now usually considered untenable. At the present time it is generally agreed that spina bifida is closely related to defective closure of the neural tube although the exact nature of this relation is not known."

Mall⁶ says that "all theories of the origin of monsters are concerned with the question whether the conditions that produce a monster are germinal and hereditary or are external influences acting upon a normal germ."

The theory which seems to be in favor now is the physicochemical. It has gained ground because certain definite malformations have been obtained by subjecting the living egg or young embryo to unusual conditions, either physical or chemical. The results obtained, the strange creatures which develop after such interference, are not infrequently⁷ comparable with malformations and monsters found among the higher animals and strongly suggest that malformations among the higher forms are the results of similar interference with the normal course of development of the egg.

Experiments with lower forms of life have been made and a great variety of monsters produced; e.g., by shaking sea-urchin eggs when in 2-cell stage so that the blastomeres are separated. Each one can be made to grow into a whole embryo. Depending upon the degree of separation, the two embryos will be separate or more or less united, forming a double monster. Frogs' eggs have been made to produce double monsters by keeping them turned upside down after the "morula stage"; the same result has also been produced by loosely tying a ligature in the furrow between the two primary blastomeres. A most curious result has been obtained by splitting the limb bud of a growing tadpole one or more times. Two or even a cluster of limbs may develop where only one does normally.

While these experiments do not prove that there are no other modes of origin for malformations possible, they indicate the importance of external influences on development and afford tangible evidence in the study of monsters. It is possible to produce typical spina bifida in frog embryos by putting them, during the early stages of development, into a 0.6 per cent solution of sodium chloride. If the eggs of Axolotl are treated with a 0.7 per cent sol. of sodium chloride, all the embryos have spina bifida (Hertwig). If the eggs of Fundulus are placed in a solution of magnesium chloride, 50 per cent of them produce embryos with eyelopia (Stockard). These experiments, from the enormous number which have been tried, lead to the conclusion that at least some malformations in single individuals are due to external influences and not to germinal defects.⁵

While we do not believe in prenatal influence or that so-called birth-marks are the result of some unusual sight, craving or emotion during pregnancy, it might be possible that we have not gone far enough in our studies of the chemistry of the body secretions and that some of the deformities which we see are but reproductions of the experiments done on the lower vertebrates, where the normal menstruum surrounding the egg is but slightly altered. We do not know precisely the effect upon the chemistry of the secretions of the body brought about by the emotions, such as anger, fear, fright, extreme joy or sorrow. Is it not possible that during the early weeks, when the human ovum is buried beneath the decidual layer and bathed by the fluids of the body, slight alterations in the chemical or normal balance of these fluids may retard organogenesis on the one hand or accelerate it on the other?

The following cases have been previously reported:

Hydrocephalus, Spina bifida, and Double Talipes Calcaneus in the same infant (Conklin*). Case history is negative. Parents both in good health. Fetus (male) stillborn, size of full term child; occipitofrontal circumference 52 cm., occipitomenal, 46 cm., vertex-coccygeal length, 32 cm. Over lower lumbar region was typical swelling of spina bifida and the feet were in position of talipes calcaneus.



FIG. 1.

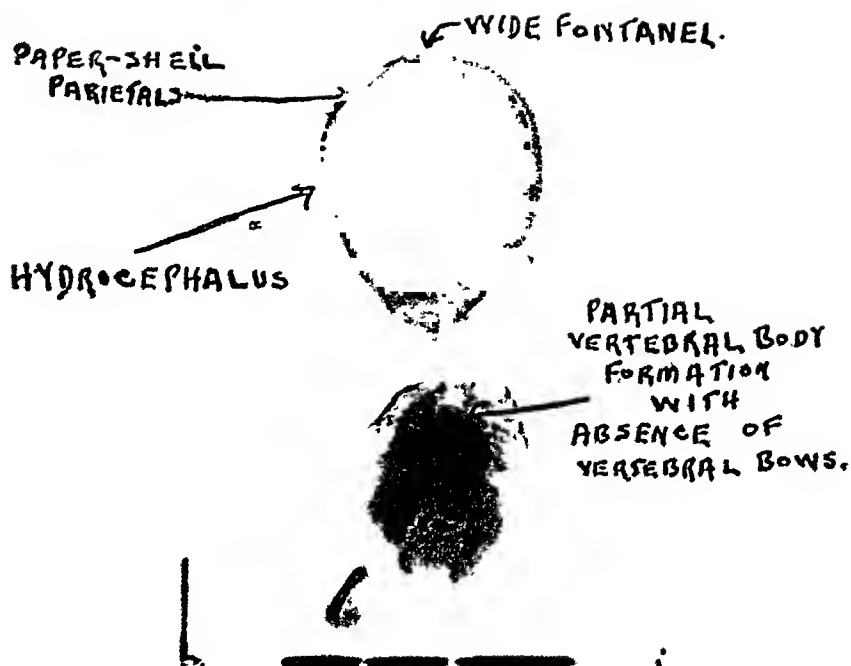


FIG. 2.

Hydrocephalus, Spina bifida, and Double Talipes Equino-varus in the same infant. (Davidson⁸). In this case an attempt was made to establish a causal connection between the mother falling downstairs during the fourth month of pregnancy and the occurrence of the deformities. The head had to be perforated in order to deliver it.

The writer's case:—Mrs. O., twenty-three years old, in good health. Husband also in good health. Wassermann negative. They have one child 20 months old which is perfectly formed. No history of injury during pregnancy or of maternal impressions. She has a simple flat pelvis with a true conjugate of 7.5 cm. Patient went into spontaneous labor two weeks before due, probably on account of the marked hydramnios present. The presentation changed from vertex to breech during the week before and could not be corrected. Fetal heart was strong all through labor, rate 140, and the membranes remained intact till complete dilatation of the cervix. The foot, in equinovarus, was hard to distinguish from a hand. In the course of the breech extraction, the spina bifida presented, followed by the enlarged head, which was delivered without puncture. Fetus was alive and of good color for about five minutes, when it expired. Hydramnios was estimated at between 3 and 4 quarts. Measurements of the fetal head were: Occipitofrontal circumference 42 cm., occipitomenal 47 cm., sub-occipito-bregmatic 39 cm. or an increase of 7, 9, and 11 cm. in the circumferences of the head over the normal averages. Vertex-occygeal length was normal.

Fourteen months later patient gave birth to a perfectly formed female infant.

BIBLIOGRAPHY

- (1) *Edgar*: Textbook of Obstetrics. (2) *Keiller*: Brain, 1922, xlv, 1, 40. (3) *Ann. of Surg.*, 1915, lxi, 153. (4) *Am. Jour. Dis. Child.*, 1913, v, 291. (5) *Bailey and Miller*: Textbook of Embryology, Wm. Woods Co., 1916, p. 607. (6) *Mall*: Quoted in (5), p. 612. (7) *New York Med. Jour.*, 1917, cv, 937. (8) *Brit. Med. Jour.*, 1910, ii, 1164.

27 EAGLE ST.

ACUTE HYDRAMNIOS AND HOMOLOGOUS TRIPLETS

BY LAWRENCE M. RANDALL, M.D.

(From the Section on Obstetrics, Mayo Clinic, Rochester, Minnesota)

ACUTE hydramnios is a pathologic condition rarely encountered, and as a complication of homologous triplets, it must of necessity be very infrequent. In approximately one of 150 pregnancies, there will be observed a definite excessive quantity of amniotic fluid, which does not, as a rule, develop rapidly. Burstal, in 1910, recorded 13,967 pregnancies with 133 instances of hydramnios, in which no mention of the acute form was made and no triplets were encountered. Chambrelent, in 1914, asserted that acute hydramnios is relatively rare, and he found only fifty cases recorded in the French literature, in none of which were triplets mentioned.

The cause of excessive amounts of amniotic fluid is not definitely known; indeed the origin liquor amnii in normal patients is not definitely known. The majority of instances of hydramnios are held to be associated with some fetal anomaly but whether these anomalies are cause or effect, or whether anomalies and excessive amounts of liquor proceed from some other unknown factor, has never been definitely determined. The condition is usually associated with multiple pregnancy, particular attention being called to the frequency of its occurrence with uniovular twins. The incidence also seems to increase with the parity of the patient.

Plauchu believes that there are two forms of acute hydramnios, the one which appears during the first months of gestation, in which group the patient reported here evidently belongs, and the one which develops in the later months of normal gestation, or supervenes on hitherto chronic hydramnios. Plauchu reported a case of acute hydramnios of the first type, and said that this type of hydramnios appears early and is marked, that it indicates twin pregnancy, and that abortion occurs at an early date. In eleven cases cited by him, two patients aborted at four months, seven at five months, and two at six months.

Clinically, the diagnosis should usually be established easily. The treatment is definite and the prognosis good for the mother, although death of the mother has been reported, due to postpartum hemorrhage incident to the extreme stretching of the uterus with consequent atony of the uterine musculature, ruptured uterus, and sepsis. For the infant the prognosis is almost uniformly bad because of anomalies often associated with hydramnios and because the pregnancy so often terminates prematurely. Krahula in 1920 collected all cases of hydram-

nios from the Bonn Clinie and cases reported in *Zentralblatt für Gynäkologie* between 1877 and 1910, and found that 103 of 291 infants were born dead; only eleven (3.78 per cent) lived, and only three (1.3 per cent) were healthy. The maternal mortality was not mentioned. Floris collected 224 cases of hydramnios which occurred in Vienna between 1910 and 1921; there were 32 twins, no triplets, 49 stillborn infants, 24 who died soon after delivery, 183 born alive, 95 premature infants, 30 monstrosities, and 5 syphilitic infants, 3 of whom lived. The case observed in the Mayo Clinie is rather unusual in that it is an instance of acute hydramnios, complicating a uniovular triplet pregnancy.

REPORT OF CASE

The patient, aged twenty-three years, para 2, was first seen February 22, 1924. There had been no multiple pregnancies among the other members of her family. When the patient was twelve years old she fell from a loft, striking her back on a wheel. In the last two years she has had some pain in the back, and recently had seemed to be "stoop shouldered." The first pregnancy terminated spontaneously at term, eighteen months before examination, after an uneventful gestation. The last menstrual period was August 28, 1923. The first four months she experienced considerable nausea and vomiting, although not severe. Urination was frequent, but there was no dysuria. The bowel movements had been regular. The patient had noted a marked and rather rapid increase in the size of the abdomen since the first month. This increase was great enough to make one suspect a possible mole formation. She had felt tired and weak, and had lost about 5 pounds in weight. Her appetite had been fair.

At examination she looked pale, rather anxious and tired. When she lay on her back on the examining table, breathing was difficult and she felt faint. Her teeth were in poor condition. Examination of the heart was negative, and examination of the lungs was negative, aside from a few râles in the bases posteriorly, which disappeared on deep inspiration. There was a moderate kyphosis of the spine in the region of the eighth and tenth dorsal vertebrae, and some tenderness on pressure. When the patient was prone, the systolic blood pressure was 88, and the diastolic 42; when sitting, the systolic blood pressure was 108, and the diastolic 72. The abdomen was the size of an eight months' pregnancy, although according to the menstrual history it should have been but six. The uterus extended nearly to the ensiform; it was rather tender and tense. The fetal parts could not be mapped out, but a hard ballotable object was made out in the left upper quadrant together with a distinct fluid wave. Fetal heart tones could be heard just to the left, and above the umbilicus, but were not distinguishable elsewhere, although carefully sought for. The pelvis was ample in size. There was slight leucorrhea, white, with no odor. There was no evidence of venereal disease. The perineum was moderately relaxed. The cervix was lacerated on both the right and left. The os admitted a finger, and the cervix was fairly well effaced. A bag of waters could be felt in the os but was not tense. Through this could be felt a soft presenting part, but the size could not be determined accurately. The hemoglobin was 60 per cent by the Dare method; the erythrocytes numbered 3,480,000 and the leucocytes 6,200. The urine had a specific gravity of 1.011, an acid reaction, albumin 1, but no casts. X-ray examination of the spine revealed some destruction of the ninth and tenth dorsal

vertebrae, but whether this was a destructive osteitis or a tuberculous process was not definitely determined. The blood Wassermann reaction was negative.

The patient was kept under observation, and March 2, ten days later, we were called to see her because of pains which she thought were labor pains. The patient was dyspneic, propped up in bed, complaining of pain originating in the lower part of the back and radiating to the front, which occurred about every five minutes. The uterus, however, did not seem to contract appreciably with these periodic pains. The most striking observation was the marked distention of the abdomen above the umbilicus. The uterus extended to the ensiform and was very tense. No fetal parts or heart tones could be made out. Through the rectum, the tension in the lower uterine segment did not seem to correspond to the feel of the fundus. The cervix was well effaced and the os admitted a finger.

The patient was sent to the hospital. Sedatives eliminated the periodic pain, but the distress from the extreme distention of the abdomen continued unabated. Her pulse rate was 110, temperature normal, and respiration 25. For forty-eight hours, she was carried along with sedatives but at the end of that time, because of exhaustion, poor general condition and no relief from pain, she was taken to the birth room with the idea of rupturing the membranes and leaving the course to Nature. The os at this time easily admitted two fingers, and a bag of waters was felt which did not seem to be under great tension. Rupture of this yielded about 300 c.c. of clear liquid and a small foot presented. An easy manual stretching of the cervix was accomplished, and a male infant, 30 cm. long weighing 650 gm., was delivered. On introducing the hand again, another bag of waters was felt which also was not under great tension. This was ruptured and again about 300 c.c. of clear liquid escaped. Again a foot presented and delivery revealed a male infant, 31 cm. long, and weighing 676 gm. Even with the delivery of these two infants the size of the abdomen was but little reduced. The hand now encountered in the uterus a very tense bag of waters in which a small fetus was ballotable. Rupture of this sac yielded about 5,500 c.c. of fluid, but much more escaped the container, and a third male child, 32.5 cm. long, weighing 686 gm., was delivered.

After puncturing the sac, the hand was kept in the vagina and fluid permitted to escape slowly, counterpressure being maintained on the abdomen. In spite of the slow release of fluid, the pulse rate rose to 144, was weak and thready, and the patient went into shock. The head of the table was lowered, and a hypodermic injection of digitalis and external heat revived her in a few minutes.

Following the delivery of the last infant, the uterus did not contract, but remained soft and flabby with only moderate bleeding. Stimulation by external massage, and 1 c.c. of pituitrin into the thigh, assisted the contraction and retraction, and the placenta was expressed from the vagina in fifteen minutes. Because of slow oozing from the uterus, and no cervical laceration being found, the uterus was packed with wide iodiform gauze.

The total fluid caught measured 6,400 c.c.; the combined weight of the infants was 2,021 gm., and the placenta weighed 1,200 gm., making a total weight of 9,621 gm. (21.12 pounds).

The placenta was single with three cords, three amnions and one chorion, attached to the posterior wall of the body and fundus. In the large upper sac which accommodated the hydramnios, the insertion of the cord was marginal but not velamentous, the vessels not leaving the cord until the placenta was reached. In the lower left insertion (the first infant delivered), the insertion was battledore,

while in the second, which lay on the lower right, the insertion was central. The three circulations were not independent.

The postpartum course was uneventful and entirely free from pain attributable to any possible cord pressure from the dorsal kyphosis.

DISCUSSION

It is rather difficult to estimate the incidence of single ovum, or homologous triplets. Twins are found about once in ninety pregnancies, uniovular twins about once in 630. Triplets occur about once in 7,500 pregnancies, so in the same proportion one might suppose homologous triplets to occur once in about 50,000 gestations.

In 1902 Saniter found nine cases reported since 1866. Meyer, in 1923, reported two single ovum triplet pregnancies. The complication of acute hydramnios with homologous triplets was noted by Giglio in 1896, in a patient who aborted at three months. In 1902, von Braitenberg reported a primipara, aged thirty-seven years, whom he attended at the fifth month of gestation. She had acute hydramnios and delivered homologous girl triplets, 25, 16 and 21.5 cm. long. The infants and placenta were normal. In the eight cases of single ovum triplets which Saniter found preceding von Braitenberg's, there were two cases of hydramnios, neither of which was acute. In one instance the infants were normal, and in the other there was anencephaly. Other instances of hydramnios with triple pregnancy are to be found in the literature. Robinson, in 1887, mentioned a patient with acute hydramnios, who aborted three normal male infants at six months, no mention being made of their being homologous. Penney, in 1889, reported the case of a patient with triplets, hydramnios and a monstrosity. The placenta was in this case not examined; one infant was a monster and the other two were normal. Lantos cites hydramnios with a triplet pregnancy which was not homologous. Grusdew and Polotebnow, in 1898, mentioned a patient with hydramnios complicating triplets, but did not mention whether or not the ovum was single, nor did they describe the placenta. Bratkoff, in 1901, recorded an instance of acute hydramnios with triplets which appear, however, not to have been homologous. Manfrini, in 1909, reported a case of acute hydramnios with triplets in which the first fetus was an edematous acardiacus, 18 cm. long; the other two living infants, 29 and 28 cm. long, were normal. The placenta was single; the cords were inserted marginally in two and velamentously in the third. The acardiacus and second born infant had a common amnion. The author believed the acardiacus at fault.

SUMMARY

A case is reported of an homologous triplet pregnancy complicated by acute hydramnios which developed early in the gestation. No satisfactory explanation could be found for the rapid development of the excessive amount of fluid. Very careful scrutiny of the babes

and placenta failed to reveal a pathologic condition. The mother was normal aside from having a questionable Pott's disease. Her puerperium was excellent and she is now in very good health.

BIBLIOGRAPHY

von Braitenberg, J.: Arch. f. Gynäk., 1902, lxvi, 633. Bratkov, N. N.: Protok. Akush-Ginek. Obsh., 1901, 201. Burstal, E.: Practitioner, London, 1910, lxxxv, 112. Chambrelent, J.: Bull. Soc. d'obst. et de gynéc. de Par., 1914, iii, 432. Floris, M.: Monatschr. f. Geburtsh. u. Gynäk., 1923, lxii, 55. Giglio, G.: Rassegna d'Ostet. e ginec., 1896, v, 462. Grusdev, W., and Polotebnow, S.: Centralbl. f. Gynäk., 1898, xxii, 664. Krahula: Quoted by De Lee, J. B. and Greenhill, J. P.: Prac. Med. Series, 1923, v, 408. Lantos, E.: Centralbl. f. Gynäk., 1898, xxii, 282. Manfrini, G.: Ginecologia, 1909, vi, 545. Meyer, R.: Ztschr. f. Geburtsh. u. Gynäk., 1923, lxxxvi, 425. Penney, E. W.: Am. Jour. Obst., 1889, xxii, 1151. Plauchu: Lyon méd., 1908, cx, 637. Robinson, F. C.: Quoted by Wilson, R. T.: Am. Jour. Obst., 1887, xx, 17. Saniter, R.: Ztschr. f. Geburtsh. u. Gynäk., 1901, xlvi, 347.

THE DIAGNOSIS OF EARLY PREGNANCY BY ROENTGENOGRAPHY*

BY REUBEN PETERSON, M.D., ANN ARBOR, MICH.

(From the Department of Obstetrics and Gynecology, University of Michigan)

EARLY pregnancy for the purposes of this communication may be considered pregnancy before the beginning of the sixth month of gestation. At this time usually a definite diagnosis of pregnancy can be established by the positive signs of this condition, the hearing and counting of the fetal heart sounds, the palpation of the outlines of the fetus and the recognition of its active and passive movements.

In 1921 in collaboration with my former colleague, Doctor Van Zwaluwenburg, I showed that pregnancy as early as the second month could be demonstrated by the pneumoperitoneal roentgen ray. Quite constantly it was found that the shadow of the isthmus of the pregnant uterus, or the cross section of the lower uterine segment, differed markedly from that thrown by the nonpregnant organ. Where pregnancy existed, the film shadow showed the isthmus enlarged in its long axis with marked extension into the broad ligaments.

In not a few cases the report of early pregnancy was made in the laboratory from an examination of the pneumoperitoneal film alone without previous knowledge of the history of the case or of the clinical findings. In addition through the changes in the isthmus it was possible to diagnosticate positively the presence of pregnancy in a fibroid uterus at a stage when it would not have been considered probable from the history and clinical findings.

However, in spite of our success in diagnosing early pregnancy

*Read by title at the meeting of the American Gynecological Society, Hot Springs, Virginia, May 17, 1924.

by means of the pneumoperitoneal roentgen ray, it was soon realized that the method was of little value except in the hands of those with considerable experience in the interpretation of such films. The roentgenologist as a rule had neither the time nor the inclination to acquire the technic of the method and co-operation with the obstetrician was not always possible. Again it was realized that the discomfort to the patient of the transabdominal injection of the carbon dioxide gas, even though reduced to a minimum, was enough to prevent the general adoption of this method. Moreover, since the diagnosis of pregnancy depended upon the location and extent of shadows not in themselves distinctive, as are the shadows of the fetal bones, even the expert would hesitate to make a positive diagnosis of pregnancy upon this sign alone. Thus the latter would always be a probable and never could be a positive sign of pregnancy, such as the auscultation of the fetal heart and the recognition of fetal movements and the palpation of fetal parts.

For the past year our efforts have been directed toward perfecting a technic whereby some portion of the fetal skeleton could be shown on the film at the earliest possible time after the ossification centers appear in the young fetus, that is, from the end of the seventh week, when the first center of ossification appears in the clavicle according to Hess,¹ up to the end of the third month when practically all such centers have appeared.

It is generally agreed that the positive identification of the fetal skeleton by roentgen ray is *par excellence* the most positive of all the signs of pregnancy. The other signs, even the so-called positive signs, depend upon evidence furnished by the examiner who may or may not misinterpret what he sees, feels or hears. To be sure the same might be said of doubtful fetal bone shadows but positive shadows are never in doubt, not even in the minds of the laymen, accustomed as they are to the appearance of the fetal skeleton.

Our efforts, then, have been directed to the perfection of a technic by means of which fetal bones could be shown on the roentgen film before the other so-called positive signs of pregnancy are commonly elicited. For instance, the fetal heart can usually be heard by the end of the eighteenth or twentieth week of pregnancy. At this latter period it is possible to recognize the fetal parts and movements if the uterine and abdominal walls be sufficiently relaxed. Long before this period it ought to be possible to show the outlines of the fetal skeleton if certain technical difficulties can be overcome.

Probably the reason more progress has not been made in attempts to show the fetal skeleton by the roentgen ray prior to quickening is the fact that the obstetrician and roentgenologist have not cooperated properly. Up to the present time, at least, the obstetrician has either neglected roentgenography altogether or has feared to use it in preg-

nant women on account of its effect upon the fetus. The last question has been answered practically by the results of thousands of diagnostic exposures where no appreciable harm resulted in either fetus or mother. It must be borne in mind that there is a vast difference between diagnostic and therapeutic roentgen ray dosages. Doctor Preston M. Hickey, head of the department of Roentgenology in the University of Michigan, has figured that the current for ordinary diagnostic roentgen ray work is not more than a fiftieth as strong as that used for therapeutic purposes where bad results have been reported, so far as the early embryo is concerned. He assures me, and is supported by the best roentgenologists, that there is absolutely no danger to the fetus at any stage of gestation provided the exposures be short and not too frequently repeated.

Theoretically it ought to be possible to demonstrate the fetal centers of ossification with the fetus *in utero* as early as the seventh or eighth week of gestation since this can be done with the fetus outside the uterus. Practically, there are certain difficulties always present which may postpone such demonstration until later no matter what may be the refinements in technique. The thickness of the abdominal wall of varying degrees in different women offers one difficulty. The maternal tissues are much denser than the structures of the young embryo, so that with the best of screens, with the voltage and exposure necessary to penetrate the tissues of the abdominal wall the ray may pass through the newly formed bones of the young fetus without showing them on the film. So far as fetal skiagrams are concerned this is a distinct disadvantage and unfortunate, for it is just in the cases of obese abdominal walls where the difficulties of roentgenography are enhanced or in some cases insurmountable, that the greatest difficulty is experienced in making a diagnosis of pregnancy by bimanual examination.

Again, the embryo is surrounded by amniotic fluid which may give rise to scattered radiation and offer a decided hindrance to the penetration of the ray with a tendency to fog the film.

While the sign of internal ballottement is not usually obtainable before the beginning of the fourth month of gestation, there is considerable movement of the fetus in the amniotic sac some weeks before this time. This movement of the fetus within the sac may occur at the time of taking the skiagram, which may be an additional cause of failure of fetal roentgenography in the early months of gestation. Furthermore, it may explain why success and failure are noted at apparently the same stages of gestation and with practically the same technique under seemingly identical conditions.

Up to the fourth month of pregnancy, the uterus is practically a pelvic organ. In order for the ray to reach the fetus, it must be directed in the axis of the pelvis, the plate being placed at the pelvic outlet in

order to avoid the bones of the sacrum. Thus it can be seen that the ray must not only pass through the thickness of the abdominal wall but through the soft tissues of the uterus and pelvic floor as well. This means a considerable absorption of the ray, estimated by Bartholomew² and his associates as sixty per cent.

It is one of the cardinal rules of roentgenography that the object to be filmed shall be nearest the plate. One reason for the clearness of the pneumoperitoneal films was that the pelvic organs were tilted forward by the knee-chest position so that they were nearer the plate. Attempts to use this position without the artificial pneumoperitoneum in obtaining skiagrams of the young fetus have not been successful, presumably because the organs do not fall forward without the aid of the gas. In the technic employed at present, that is, the directing of the ray from above in the axis of the pelvis the plate is quite far away from the fetal parts, which may account in an appreciable degree for some of the failures.

Since the density of the fetal structures, the amniotic fluid surrounding the fetus, the movements of the very young embryo, the tissues of the pelvis, uterus and abdominal wall, are facts necessarily unchangeable, it would seem as if better roentgenographic results could only be obtained by some change in technic whereby the plates can be placed nearer the object to be filmed. This is the problem Doctor Hickey and I are working upon now with the expectation of reporting our results later.

In the present communication we wish to report the results of twenty-two roentgenograms of pregnant patients whose gestation periods ranged from between two and three to between five and six months.

They were not selected cases but patients who presented themselves at the hospital clinic with symptoms referable to the pelvis. Some were sent in for diagnosis, others for operations such as the removal of fibroids. While it was not always possible to make a positive diagnosis of pregnancy, the latter condition was thought probable in all the cases and either absolutely proved by the roentgen ray, the fetal heart or fetal movements or the patients were demonstrated to be pregnant by the subsequent histories.

The twenty-two cases have been divided into groups according to gestation periods. Each case has been assigned to a group after a careful consideration of all data available for that particular case, such as the date of the last normal menstrual period and the position of the fundus in relation to the pubes or umbilicus. It has been felt that the gestation period could only be approximated and not definitely settled. The gestation period certainly cannot be determined by the height of the fundus above the pubes or, its relation to the umbilicus, since the size of the uterus may be influenced by too many factors such as multiparity, amount of amniotic fluid and the size of the fetus. It is also

well established that the relative position of the navel varies in different individuals which prevents its use as a fixed point to be used in establishing the gestation period through the height of the fundus. It is well known from common experience that the estimation of the probable date of confinement or the period of gestation from the beginning of the last normal menstrual period may or may not be correct. Experience is invaluable in arriving at conclusions as to the period of gestation, but the impossibility of knowing in each case the time the ovum and spermatozoon met will always prevent more than an approximate estimate of the duration of pregnancy.

Hence, the cases have been grouped not exactly but approximately as follows:

GROUP	GESTATION PERIODS IN MONTHS	NUMBER OF CASES	POSITIVE ROENTGEN-RAY FINDINGS	NEGATIVE ROENTGEN-RAY FINDINGS
1	2-3	1		1
2	3-4	8	3	5
3	4-5	6	3	3
4	5-6	7	7	
		<hr/> 22	<hr/> 13	<hr/> 9

The gestation periods are arranged from the beginning of a month to the beginning of the next. For example, group 1 means from the beginning of the second month, that is, from the second date when the menstrual period should have appeared to the third of such dates.

When there was any doubt about the period of gestation the case was placed in the higher rather than the lower group because we were trying to find fetal bones by the roentgen ray as early in gestation as possible. In only a few cases was it possible to check up on the gestation periods by reckoning back from the date of confinement. Even by this method errors may creep in because of the possibility of the prolongation of pregnancy, the extent of which cannot be estimated.

As would be expected the proportion of positive roentgen-ray findings increases with the advance in the gestation period. In the single case between the second and third month subjected to the ray there were negative results, as would be expected. While the ossification center in the clavicle starts at the seventh week, under the difficulties of fetal roentgenography mentioned above, probably for all time to come it will be a waste of effort to attempt to show fetal bone shadows between the second and third month gestation period. However, each case should be carefully scrutinized and if there be any doubt as to whether it should be placed in the first or second groups, it should be given the benefit of the doubt, placed in group two and subjected to the ray.

In the second group, eight in number, where the patients were from three to four months pregnant, positive bone shadows were found in three out of eight cases. In the next or third group, gestation period between four and five months, six cases in all, the findings were positive

in three or one-half of the cases. In the last or fourth group, seven cases in all, between five and six months pregnant, there were seven positive findings or one hundred per cent.

We wish here to acknowledge indebtedness to Doctors Stein and Arens,³ of the Michael Reese Hospital of Chicago for their uniform kindness and courtesy, and for their aid in our work. It was the demonstration of their success with fetal roentgenography that impelled us to take up this work. Starting with their technic the latter has been modified as our own experience increased. It is with some hesitation, however, that we report our results in this very interesting field in the light of their great experience with over four hundred cases. They state that out of these cases in only three were they sure with roentgenography of the fetus before quickening. Horner⁴ reports two hundred fifty cases in which the roentgen ray was employed in pregnancy at the Chicago Lying-In Hospital and states that his youngest fetus was of five months. He thought that the fetus could not be demonstrated before quickening. Bartholomew² and his associates as a result of roentgenography with twenty-four patients could only obtain a fetal roentgenogram from the beginning of the fifth month of pregnancy. As a result of their investigations they concluded that fetal roentgenography was uniformly negative during the third month of pregnancy or during the period here designated as group two, from the beginning of the third to the beginning of the fourth month of pregnancy. O'Donnell⁵ states that the fetus can be clearly determined from the fourth month but he does not mention cases or give his technic. In a recent article Edling⁶ gives results with early roentgenography in 19 cases which undoubtedly are the most successful of any published. His previous work in this connection has been criticised as inaccurate in that he did not give sufficient data regarding the date of the last menstrual periods or the height of the fundus. It must be remembered that Edling⁶ has had an unusual obstetrical material to draw upon as many abnormal maternity cases are referred to him for roentgenography from Essen Moeller's clinic. In the paper referred to he says he has examined two hundred seventy pregnant women by roentgenography, not as a routine but to answer questions arising from facts connected with these cases.

Even allowing for certain errors in estimating the periods of gestation, and as has been pointed out, all such estimations are likewise liable to be in error, the positive results in Edling's⁶ series of early fetal roentgenograms are very striking.

There were nineteen cases of early pregnancy examined by roentgenography with the following results: Two were under three months and were negative, as would be expected. Evidently Edling⁶ does not include these among the nineteen cases where results are as follows:

third month, 3; between third and fourth month, 7; fourth month 7; between fourth and fifth month, 4. All these save one gave positive fetal roentgenograms, certainly a remarkable showing and makes it quite imperative that Edling⁶ publish his technique in detail so that others may profit by it.

While pregnancy was suspected in all the twenty-two cases reported, the usual positive signs of pregnancy were absent except in five cases where the fetal heart sounds were heard and counted. It was absent in the eight cases in group two between three and four months gestation, present in one case in group three, and in four cases in group four. In other words, while we were quite sure the patients examined were pregnant, in only five cases except for the evidence of the roentgenogram were we positive the patients were pregnant. This is a sufficient answer to those who decry any new method of diagnosis, on the ground that the older tried methods are being pushed into the background and that soon the diagnosis of normal and abnormal obstetrical conditions will be made in the roentgen ray laboratory.

The technique used in the twenty-two cases reported varied according to the weight of the patient, the thickness of the abdominal wall through which the ray had to penetrate and the period of gestation in which it was attempted to demonstrate the fetal roentgenogram. The kilovoltage varied from 45 to 55, the milliamperage between 20 and 30. The spark gap was from 5 to 6 inches and the focal distance varied from 28 to 30 inches. Time of exposure varied from 8 to 12 seconds and double screen superspeed films were used in addition to the Potter-Buekey diagram.

While the great advantage of a positive sign of pregnancy, obtained by the roentgen ray, at a period of gestation too early to elicit the other positive signs of pregnancy should be apparent to anyone, it may not be amiss to report two illustrative cases.

The first case is that of a young unmarried woman, aged twenty-two, who came to the clinic for amenorrhea of between three and four months' duration. She denied exposure but the breasts were enlarged and colostrum could be expressed from the nipples. The cervix was softened and connected with an enlarged uterus rising halfway to the umbilicus. Neither the fetal heart, fetal parts, nor fetal movements could be elicited. The clinical diagnosis was pregnancy, nearly four months. Roentgenography showed fetal bones present. Confronted with the absolute proof of her true condition, the patient confessed exposure and subsequently was delivered at the maternity clinic at which time the approximate date of the gestation period at which the roentgenogram was obtained was confirmed.

Clinically we were quite sure this patient was pregnant but we were not positive until the fetal roentgenogram was obtained. To be sure the experienced examiner is so positive in his own mind that patients like the one in the case cited are pregnant that he makes very positive statements, but he does so without the positive signs of pregnancy being present and surely may be mistaken in his conclusions. Still he much

prefers a positive diagnosis backed by undoubted signs of pregnancy. So much so is this the case that the usual procedure is to state that he thinks pregnancy is present or that he is quite certain but that in another month, since exposure is denied, the diagnosis will be absolutely established by the presence of the positive signs of pregnancy.

The weakness in the roentgen ray sign of early pregnancy is its uncertainty with the present technic. If fetal bone shadows are shown earlier than the other positive signs of pregnancy appear, the patient is pregnant beyond dispute. However, negative findings up to the beginning of the sixth month of gestation are very far from being conclusive, as shown by our work where there were five negative roentgenographic findings out of eight patients pregnant between three and four months, as absolutely proved by their subsequent histories. However, the fact that the present roentgen-ray technic is unsatisfactory in this class of cases does not mean that there exist reasons for such failure impossible to overcome by improvements in technic.

The second case is that of a married woman of forty-four who applied to the clinic for loss of strength, prolapse, and a tumor thought to be a fibroid by her family physician. The patient had had four living children and was positive that she was not pregnant, explaining her five months' amenorrhea as due to the change of life. Examination showed the clinical signs of pregnancy between five and six months but neither fetal parts nor the fetal heart sounds could be elicited. Roentgenography showed a fetus with an estimated development of between five and six months. Although this patient had been very indignant at the suggestion of pregnancy, stating she knew from her experience more than the examiner and that her physician had sent her to the hospital to have a fibroid tumor removed, she was immediately convinced and mollified when shown the fetal skiagram.

Since roentgenography demonstrates pregnancy long before the fetal heart can be heard, it behooves the surgeon to make use of this diagnostic sign at the time of the menopause before attempting the removal of what is apparently a fibroid tumor. Many good surgeons have been deeply humiliated by discovering their mistakes after the abdomen has been opened. Furthermore, in case of such an error, it is questionable how much longer they will be held guiltless if roentgenography has not been employed prior to the operations.

CONCLUSIONS

1. Roentgenography is a valuable aid to the obstetrician in making a positive diagnosis of pregnancy before the other positive signs of pregnancy are present.
2. With the present roentgenographic technic, no fetal skiagram can be obtained before the beginning of the third month of gestation.
3. Negative roentgenography will exceed positive findings between the beginning of the third to the beginning of the fourth month of gestation.

4. At least one-half the roentgenograms should be positive from the fourth to the fifth month of gestation and all should be positive beyond this period.

5. A positive skiagram of the fetus *in utero* is proof positive of pregnancy even before the gestation period when the other positive signs of pregnancy can be elicited.

6. The reverse is not true for with present technic negative findings before the beginning of the fifth month do not mean that the patient is not pregnant.

7. Beginning with the third month of gestation roentgenography should be employed in doubtful cases as an aid to diagnosis, since with the proper technic no harm will result to either mother or fetus.

REFERENCES

- (1) Hess, J. H.: The Diagnosis of the Age of the Fetus by the Use of Roentgenograms, Illinois Med. Jour., 1918, xxxiii, 73-88. (2) Bartholomew, R. A., Barnes, E. Sole, Calloway, J. T.: Diagnosis of Pregnancy by the Roentgen Ray, Jour. Am. Med. Assn., 1921, lxxvi, 912. (3) Stein, Irving and Arens, R. A.: Roentgenograms of the Fetal Skeleton as a Positive Sign of Pregnancy, Jour. Am. Med. Assn., lxxxi, 4-8. (4) Horner, D. A.: Roentgenography in Obstetrics, Surgery, Gynec. and Obst., 1922, xxxv, 67. The Effects of Irradiation on Fetal Development, AM. JOUR. OBST. & GYNEC., v, 461. (5) O'Donnell, Patrick S.: X-ray Findings in the Differential Diagnosis of Early and Late Pregnancy, Jour. Am. Med. Assn., lviii, 748. (6) Edling, L.: Roentgen Diagnosis of Pregnancy, Radiology, ii, 1.

Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY

FORTY-NINTH ANNUAL MEETING

HOT SPRINGS, VA., MAY 15, 16, and 17, 1924

(Continued from November)

DR. JAMES R. McCORD, Atlanta, Ga., (by invitation) presented a report on **The Results Obtained in a Conservative Teaching Clinic Among Twenty-five Hundred Negro Patients.** (For original article see page 723.)

DISCUSSION

DR. RAYMOND E. WATKINS, PORTLAND, OREGON.—The outstanding feature of this paper is the high mortality from toxemia and sepsis. With 30 to 35 per cent of the cases having a four-plus Wassermann complicating pregnancy, it is no wonder that there is a high mortality, for undoubtedly syphilis as a complication would increase the gravity of the situation.

Our experience in the West with the negro is very small but we have found that the percentage of contracted pelvis in the black woman is greater than in the white. This is compensated for, however, by the fact that the babies are usually smaller and their heads mold more readily.

I do not believe that Dr. McCord can be accused of being radical if one compares his percentage of operative procedures with those of other clinics. He has been extremely conservative. It would be interesting to know what percentage there was of injuries to the perineum and cervix and whether the cervix was repaired at the time of delivery and the results.

DR. C. JEFF MILLER, NEW ORLEANS.—I would say that Dr. McCord's presentation is a very good report from material that is unusually bad. I can appreciate the conditions under which he produced his results because for a number of years I worked in a similar clinic and in a general way I can say that the percentages which he states tally fairly well with the results obtained at the New Orleans Charity Hospital, where we have a large obstetrical clinic for colored patients.

There are a few points which I think might be mentioned in justification of some of the results Dr. McCord has reported. Colored patients make excellent teaching material, and in spite of a general impression to the contrary are fairly good surgical risks, but the trouble is that they do not apply to the clinics, as do the whites, until they are forced to by real inconvenience or pain. Indeed, the majority come only for relief from pain, and it will take considerable education to have them take advantage of the prenatal clinics and obtain the good results that come from routine observation. For this reason our services in the delivery wards will always show a large percentage of bad material.

Dr. McCord's paper gives us some valuable data in the study of the comparative incidence of disease in the negro and white races, a study which is always

of extreme interest and which has been gone into rather thoroughly by Matas, Corson and others.

When I was asked to discuss this paper I took occasion to review hurriedly the statistics of 5,500 deliveries covering a period of ten years at the New Orleans Charity Hospital, and including premature as well as full term labors. The maternal mortality in this series was 2 per cent, while the fetal mortality was 9 per cent. In a large number of cases, no fetal heart sounds could be made out when the mother was admitted, and the corrected fetal mortality would therefore be appreciably lower. The negro woman does not stand the strain of a toxemia as well as the white, and this is one explanation of the high maternal mortality. Syphilis, of course, was encountered much more frequently in the colored service than in the white, but my personal experience has been that it does not increase the maternal mortality to any marked degree. Forceps was applied 76 times, an incidence practically coincident with Dr. McCord's figures; cesarean section was done in 53 of the cases, not quite one per cent, and craniotomy in four cases. There were 219 cases of retained placenta.

I believe that the statistics of forceps operations do him an injustice; a study of the cases will show in many instances that the catastrophe was due to other causes than the application of the forceps. The high mortality for the double forceps operation also has extenuating factors. I have frequently resorted to this procedure, and while I am not enthusiastic about it, I believe that if it is carefully done the results are usually satisfactory. The statement that such cases would be better delivered by version I believe is open to debate. The case which has advanced far enough to make a forceps application possible is often a treacherous one in which to employ version, and I think the results in advanced labor are more disastrous with version than with forceps.

DR. HERBERT M. LITTLE, MONTREAL, CANADA.—Dr. McCord's report, deals with, what seems to be incomparable clinical material; and his results should be very acceptable to many members of this Society who always at least *talk* conservatism: yet, so far as the actual statistics are concerned, I doubt if the results obtained would have varied greatly for the worse even with the most radical treatment.

The previous speaker has discussed the question of infection and mortality in negro localities. It is doubtful if this is different elsewhere. Recently in correspondence with Dr. G. W. Mosher, regarding the causes of death in labor, I looked up an old paper written some years ago with a view to determining the causes of death in labor, and then checked the result with the statistics of sixteen years in the Montreal Maternity Service; and found that, in each instance, approximately 44 per cent of deaths were due to toxemia, 35 per cent to 40 per cent to infection, and the balance to accidents of labor—hemorrhage, rupture of the uterus, etc. Infected cases admitted from outside may, undoubtedly, increase mortality, but are of inestimable value for the formation of clinical judgment.

The results from the application of forceps are not good, and I think that a marked increase in the number of applications might have given a corresponding decrease in unfortunate results. A number of the forceps deliveries are classed as Seanzoni operations. Properly undertaken, the application of the blades of the forceps to the sides of the head, arrested in R.O.P. or L.O.P., followed by moderate downward traction will, in a very large proportion of the cases, result in rotation of the head forward, necessitating removal and re-application of the forceps for a simple delivery. If however, the first application is conceived primarily as a rotation maneuver, there will inevitably be reports of serious damage to the base of the bladder and to the urethra. How a Seanzoni operation could

be necessary in a patient with a flat pelvis, where the head engages transversely, I confess I do not see.

It is fashionable to condemn version, but ability to perform version properly is the hallmark of obstetric competence. When the operation is undertaken after an attempt with forceps, particularly when the results of forceps application are as shown, it is no wonder the operation has been a 100 per cent failure.

I do not understand the frequency of hemorrhage, and might repeat that the fear of hemorrhage is one of the most important factors in its causation. In the last fifteen years I remember once packing a uterus for hemorrhage, and I have used Mombert's tube perhaps twice. This infrequency of severe hemorrhage I ascribe to the frequency with which we practise episiotomy,—a median episiotomy allows of a very simple and satisfactory repair during the third stage without additional anesthesia. In 99 per cent of the cases the placenta separates spontaneously, and there is no necessity for the administration of pituitrin. Manual removal of the placenta may occasionally be necessary, but our experience with this operation, gained largely from its use in association with vaginal hysterotomy in cases necessitating rapid delivery, has proved that, if carefully performed, it is devoid of danger.

DR. E. P. DAVIS, PHILADELPHIA.—Forty per cent of the clinical material at the Jefferson Hospital is negro, and we have few of the old pure breeds but many of the degenerate negroes. Our experience is briefly as follows: contracted pelvis is common among them, and in estimating the size of the pelvis one must remember that the sacrum is often unusually thick and that one will get very little information by external examination and must supplement it by palpation.

While some of the negro babies are small, some of them have a very thick cranium and that adds to the difficulty and may sometimes make vaginal delivery impossible.

In our experience the negro has syphilis, tuberculosis, or gonorrhea,—one, two or all three of them,—habitually in the pelvic premises, and we consider them as potentially and practically infected as they come under our clinical observation. A form of infection which is especially interesting and not uncommon, and which explains the toxemias of the negro, is the chronic infection of the small intestine. We have had two cases die after complicated labor, where a thorough autopsy was made. The genital tract was sterile but the small intestine was infected and the lesions resembled somewhat the typhoid Peyer's patches, although typhoid was ruled out by bacterial examination.

Negroes will come to a prenatal clinic and will frequently follow directions remarkably well both before and after delivery; they are reasonable, tractable and good clinical material. Our management of them is usually to do as little to them as possible; we watch them closely and see what happens; by all means getting the head through the brim of the pelvis by natural force if possible. If we do interfere, we do so under thorough surgical precautions, guarding against hemorrhage and securing very free drainage of the uterus.

In performing abdominal section on the septic negress, we do a supravaginal hysterectomy, leaving the stump outside the abdomen, while in the white woman we take a greater chance and save the uterus.

DR. GEORGE W. KOSMAK, NEW YORK.—For a Northerner to venture any opinion on the delivery of negroes might seem out of place, and yet with the large influx of negroes into our cities during the past few years we have come in contact with this problem. At the New York Lying-In Hospital the very large increase of negro patients has made us rather skeptical as to the effect on our statistics insofar as complications were concerned, but strange to say, and happily so, there

have been no bad results introduced. We find that these negro patients seem to go through labor very satisfactorily and, as Dr. Davis has said, they are very tractable. We find no difficulty in getting them to come to our prenatal clinic or to follow directions afterward. A great proportion of them, it is true, have deformed pelvises. The flat pelvis is very common, but in most of these cases the baby's head is so soft that delivery is not so complicated as it would seem from the preliminary mensuration.

The low incidence of forceps deliveries in Dr. McCord's cases is rather striking. If more of these women could have been delivered by forceps, possibly the final results would have been better.

As regards toxemia, I do not believe that applies to the North. Whether the diet has some influence I do not know, but we do not have as large a proportion of toxemias among the negroes as we do particularly among the Italian and Jewish races.

It is my belief that if the head refuses to go through by the usual route, there is very little better chance of getting it through by version, and I am inclined to disagree with the commonly accepted statement that version is an easy process. I believe that more care should be taken in the application of forceps.

Dr. McCord demonstrated quite conclusively that better prenatal care is needed among these women and if that can be accomplished in the next decade and their general hygiene can be corrected, I think his later results will show great improvement. This would include the recognition of syphilis and gonorrheal infections, as well as all constitutional conditions, and if these can be properly noted and cared for I am sure that when the Doctor presents his next 2500 cases his general results will be very much better than in this series.

DR. C. H. DAVIS, MILWAUKEE, WIS.—Is it not possible that the length of the labor may have something to do with the lowering of resistance in the women and the increase in sepsis? May I suggest that in all of these potentially infected cases the head of the bed be elevated, keeping it elevated for four or five days, to aid in drainage.

In potentially infected cases, I like to use a mercurochrome solution to thoroughly cleanse the vagina. Any of you who have made cultural studies after using mercurochrome will agree that it gives us great advantage in these cases.

DR. WILLIAM R. NICHOLSON, PHILADELPHIA.—It is very likely that I may have a better realization of the work represented by this paper than most of those present, since I have done a great deal of work in the control of the midwife situation in Philadelphia, and therefore I realize the difficulties with which the essayist has had to contend. Of course his material was of a very low physical type, which explains certain of his results. My figures are very different because I deal with what might be called "selected risks."

There is certainly a lack of understanding upon the part of the government as to conditions as they actually exist. If animals were being raised for breeding purposes by the government the greatest care would be exercised, the best possible quarters would be supplied, and also the best sort of attention. In the question of childbirth, however, this is not the case. If facts, as they are, could be presented to the public, there would be a demand for reform so insistent that it would have to be given the most careful attention. A large sum of money would be required, but if this were forthcoming, statistics could be produced which would astonish the world. My own experience in a large city overseeing some 6,000 to 8,000 cases a year, has proved that to me beyond the peradventure of a doubt.

DR. JOSEPH B. DE LEE, CHICAGO.—Dr. McCord need not fear to present his records before us. The Germans say "Vor den Wissenden sich stellen, besser ist in allen Fällen." "To present your cases before those who know is the best possible procedure." At the Chicago Lying-In Hospital our percentage of negroes has gone up tremendously in the last two or three years, and also the mortality and morbidity statistics, contrary to what Dr. Kosmak has said regarding New York.

I believe the modern woman cannot so well meet the demands of civilization. Probably the negro in a natural environment would not have eclampsia, but transferred to our modern conditions she develops all forms of toxemia.

I was surprised that Dr. McCord did not show a larger percentage of contracted pelvis. Our percentage of positive Wassermann reactions has gone up from 4.1 per cent six years ago to 11.5 per cent in the last year. I approve very decidedly of his conservative treatment of these cases and I would hesitate to contemplate the effect on that clientèle of the radical and interfering methods that are more or less prominent in the North.

DR. MCCORD (closing).—Most negro labors are short. The fetal mortality is very high. 50 to 60 per cent of our cases attend prenatal clinics. I am a better version operator than I am a forceps operator.

DR. JOHN O. POLAK AND DR. SAMUEL WOLFE, Brooklyn, N. Y., presented **A Further Study of the Origin of Uterine Bleeding in Tubal Pregnancy.** (For original article see page 730.)

DISCUSSION

DR. E. A. WEISS, PITTSBURG, PA.—It is generally accepted that there is a uterine decidua vera no matter where the ovum is implanted and develops. It has also been taught by many that the bleeding attending ectopic pregnancy came both from the uterus and the tubes as well.

Sampson's most excellent work with injected specimens of uteri removed with ectopic pregnancies showed us that the uterine bleeding in all cases was distinctly of venous origin and came from the endometrium and at no time did it issue from the tube into the uterine cavity. Dr. Polak's observations and close study do not seem to substantiate all of Sampson's conclusions, for he has demonstrated that in many cases there is an actual discharge of blood from the tubes into the uterus.

Since the publication of Sampson's work on this subject we have endeavored to satisfy ourselves as to the clinical application of his observations made with injected uteri. In tubal abortions it is reasonable to conclude that there will be little or no back flow into the uterus from the tube but a different condition exists when the pregnancy is near the cornu, because histologic sections have shown us that the tubal mucosa at or near the uterus closely resembles uterine mucosa, especially after decidual transformation, so that even after total or partial expulsion of the uterine decidua, there may be tubal bleeding into the uterus.

The occurrence of vaginal hemorrhage usually indicates death of the embryo. Such bleeding may persist even after the primary shock. While not severe, such wasting sometimes persists and can be attributed, as Polak has pointed out, to the possibility that some of the chorionic villi are still alive and exert a stimulating effect by producing a new decidual reaction in the uterus.

Experience has shown us that tubal pregnancy is not always terminated at the time bleeding occurs. A recent case in point is that of a patient operated

by us for extrauterine pregnancy 12 years ago. After nine years of sterility and practically normal menstruation there was amenorrhea for eight weeks, but as the patient was then 44 years old she believed herself entering the menopause and did not seek medical advice. A persistent and rather free bleeding for five days accompanied by clots and shreds and attended with labor-like pains, was likewise disregarded. Then after six weeks more, with no bleeding a sudden violent attack of pain occurred. Recalling then her first attack of 12 years ago, the patient applied to the hospital, having diagnosed her own condition. Operation revealed an ectopic in the other tube of at least 3½ months and fetus living, showing quite clearly that death had not occurred when she had vaginal bleeding six weeks previously.

Dr. Polak has observed that many tubal pregnancies are operated before the pregnancy is terminated. This has not been our experience. We believe that only a very small percentage are operated before rupture or abortion and in a review of over 250 of our personally operated cases only 11 or less than one half per cent did not have abortion or rupture or at least some peritoneal bleeding, for we believe that blood in the peritoneal cavity in the presence of tubal pregnancy is a more constant sign of death of the embryo than is uterine bleeding.

We are still of the opinion therefore and agree with Dr. Polak that bleeding in ectopic is mostly from the uterus and to a lesser degree from the tube.

DR. HENRY T. BYFORD, CHICAGO.—Did the bleeding after curettage stop earlier than in cases not curetted? My idea was that the tears in the pelvic peritoneum about the tube kept up the flow after the death of the fetus, and in that case the curettage would disturb things more and be followed less promptly by cessation of the flow than otherwise.

DR. JOHN A. SAMPSON, ALBANY, N. Y.—The paper which I presented before this Society in 1913 was based on the study of twenty-five uteri which had been removed, together with the tube, containing an extrauterine pregnancy. The veins or arteries of both of the uteri were injected in order to determine the changes in the blood supply of the uterus caused by the tubal pregnancy and also to detect the source of the uterine bleeding usually present in these cases. The endometrium of all the uteri was studied histologically and in many cases it was similar to that obtained from the uterus of an early uterine pregnancy which had been terminated but all of the products of conception had not escaped from the uterus. In the latter cases uterine bleeding is usually present. It may be profuse, scanty, more or less continuous or intermittent. The interesting feature is that if we curette the uterus to remove all the products of conception the bleeding usually ceases almost immediately. I compared the condition of the uterus of tubal pregnancy removed by operation with that found in a terminated early uterine pregnancy in which all of the products of conception had not been removed. In both cases a condition of subinvolution of the uterus is present. In the tubal pregnancy the products of conception, usually still present in the tube, exert upon the uterus the influence of pregnancy and interfere with the involution started by the termination of the pregnancy.

There was no difficulty in demonstrating that the uterine bleeding was of venous origin and arose from the endometrium. In none of my cases was I able to show that the uterine bleeding sometimes arose from blood escaping through the lumen of the tube into the uterine cavity. My inability to demonstrate this may have been due to several factors. Only twenty-five uteri were studied and it may be a more infrequent source of bleeding than the uterine mucosa or possibly

the uteri were not removed at a time in the course of the tubal pregnancy when this type of bleeding occurs. Another factor is that it is very difficult to inject the blood vessels of the tube in tubal pregnancy because there is so much leakage from the vessels of the tube injured by the termination of the pregnancy.

I wish to thank Dr. Polak for continuing the study of this very interesting subject and for calling our attention to the fact that apparently the involution of the endometrium associated with tubal pregnancy is slower after all the products of conception have been removed than after removal of the products of conception in a uterine pregnancy; and also calling attention to the fact that bleeding sometimes occurs from the tube into the cavity of the uterus. I tried to demonstrate the latter in the experiments which I made, but was unable to do so.

DR. EMIL NOVAK, BALTIMORE.—Dr. Polak agrees that it is the death of the embryo which is responsible, in most cases, for the involution of the endometrium and the appearance of the external bleeding. This is not surprising when one recalls the mechanism of normal menstrual bleeding. The premenstrual hyperplasia in the endometrium continues until the death of the ovum, which has been thrown off some two weeks previously. When the ovum dies the pregravid endometrium, which has been prepared for it, involutes and is cast off, with the bleeding which we call menstruation. So long as a live embryo is present this involution is inhibited. This was illustrated in a case which I observed of combined intra- and extrauterine pregnancy. The patient had all the signs of cataclysmic abdominal hemorrhage but there was no external bleeding whatsoever. A ruptured tubal pregnancy was found. At the time of the operation the uterus was only slightly enlarged and no special attention was paid to it. Some weeks after the patient was sent home I received a letter from her doctor saying that she had just aborted, expelling a fetus of about three months' development. In other words, she had had a live fetus in the uterus at the time that she was operated upon for the ruptured tubal pregnancy, and the presence of this live fetus had inhibited uterine bleeding.

Dr. Polak suggested that, in certain cases, external bleeding is due to the escape of blood into the uterus from the uterine end of the pregnant tube. He has studied the question very intensively, but I believe that it will merit even further investigation. A recent patient had had vaginal bleeding for six weeks. On opening the abdomen there was a smooth unruptured tubal gestation, without a drop of blood in the pelvis. If the external bleeding had been of tubal origin it seems hard to believe that there would not also have been some bleeding through the open end of the tube into the abdominal cavity. Finally, I agree with Dr. Polak in his statement that the endometrium goes through a form of involution comparable to that seen in the case of uterine pregnancy. The diagnostic value of the microscopic examination of the curettings in cases of tubal pregnancy is thereby very much lessened, because so frequently, after the death of the fetus, only a normal endometrium can be found with little or no trace of decidual reaction.

DR. DOUGAL BISSELL, NEW YORK.—Ectopic gestation may complicate intra-uterine pregnancy and may be alone recognized. Under these circumstances, if the regular uterine bleeding is treated by curettage and packing, the normal gestation must be sacrificed. My practice therefore is not to curette preceding the operation for the removal of ectopic gestation because it is altogether unnecessary, as nature automatically stops the uterine discharge if the ectopic alone is the cause of it. To curette consumes time with loss of blood and there is the additional risk of removing a normal conception. By not curetting, I was enabled

in one case to save and carry to full term an intrauterine conception of the same age as the ectopic which complicated it.

DR. EMIL NOVAK, BALTIMORE.—I believe that Dr. Bissell misunderstood my interpretation of this case. The symptoms pointed definitely to ruptured tubal pregnancy of the tragic type, except for the absence of vaginal bleeding.

DR. J. C. LITZENBERG, MINNEAPOLIS, MINN.—I want to correct Dr. Polak's quotation of mine. Yesterday I pointed out the presence of blood in the tubes, but I did not say it was going into the uterus; in fact, I believe it was not. The slides showed no connection between the hemorrhage at the site of the ovum and the blood in the tube. I am convinced that the term "tubal abortion" is a misnomer and should be called "internal rupture," because in none of my collection of pregnant tubes have I ever been able to find a separation of the ovum, but have always been able to find a rupture of the internal capsule into the lumen. Even when we see the ovum bulging from the end of the tube, I think it is simply growing in the direction of least resistance. I do not believe a tubal pregnancy has ever been expelled by the musculature of the tube, because it is anatomically impossible.

DR. CAREY CULBERTSON, CHICAGO, ILL.—There is one point that I believe may be a factor in continued bleeding which has not been brought out, and that is the reappearance of menstruation. Some of these cases are of long duration; the patient may have been sick for five or six months from the beginning of the pain, the time at which the hemorrhage probably took place. We know that after abortion it sometimes requires two or three months before the menstrual cycle begins to be reestablished, and the same may be true after ectopic bleeding; the patient is carrying what might be regarded as a chronic hematocele, and in some measure the bleeding may be due to an attempt to reestablish the menstrual cycle.

Dr. Litzenberg brought up the subject of nomenclature with respect to rupture and abortion. I agree with him that these cases are not abortions in the sense that we have uterine abortions. I had one case, and have seen one other, in which the gestation sac was hanging out of the tube as if it were being squeezed out. In that case the chorionic villi were attached to the edges of the fimbriae. I have seen two cases with the same villous attachment, in which there were no sacs at all, but extensive hematoceles had developed.

DR. POLAK, (closing).—I do not wish to be misconstrued in this study. It is only a preliminary report and the observations are being continued. We are trying in each individual case to correlate the intrauterine findings at different periods with the tubal findings and the clinical history, and we believe that ultimately something will throw light on exactly what happens.

There is no doubt that what Dr. Sampson has worked out, takes place in the majority of these cases, but what we are trying to find out is what happens inside the uterus. In one case of interstitial pregnancy we have positive proof that the bleeding came in that instance from the uterine end of the tube.

In regard to the question of abortion, these cases, depending entirely on what our conception of that condition is, all show a hemorrhage into the intervillous spaces which is so excessive that it proceeds into the capsule and causes an unrest of the ovum, and not until then do we get bleeding.

The intraabdominal bleeding through the abdominal ostia, in most cases, is due to the very large proportion in the free end of the tube, and we get no hemorrhage on the proximal side. It is only in the interstitial cases that we claim there is bleeding from the tube into the uterus.

DR. H. C. BURGESS, Montreal, Que., (by invitation) presented a **Clinical Consideration of the Contracted Pelvis**. (For original article see page 739.)

DISCUSSION

DR. WM. E. CALDWELL, New York.—Probably due to the large number of negro and foreign women in our Clinic we seem to have a larger number of contracted pelves than Dr. Burgess reports. The standard classification of the contracted pelves is of great value in anthropologic and developmental studies but too difficult to teach and to remember and unnecessarily complicated for routine obstetrical practice. The classification which Dr. Burgess suggests covers the majority of the contracted pelves, is easy to teach and is all that is necessary for practical obstetrics.

Which type of pelvis to classify as due to rickets, is causing us a little trouble just now. In the last 7,000 deliveries there have been but two cases of advanced rickets where the spines were further out than the crests. On the other hand the typical sliding forward and rotation of the sacrum with a wide transverse outlet we have found among patients who show no other signs of rickets, and even among our West Indian women, among whom according to Hess and others, rickets does not occur.

Another type of abnormal pelvis that is found frequently in the Sloane Service, especially among women from the Balkan States, is the very deep pelvis with a symphysis of 8 cm. or more, frequently with six sacral vertebrae, a bad inclination, a narrowing of the pubic arch but usually a good posterior sagittal. Though a great many of these women deliver normally, parietal presentations, early rupture of the membranes and difficult labors are common. In this type of a case the fascial reflections are attached very low, causing a short anterior vaginal wall so that the cervix retracts with difficulty. In this type of a case version and breech extraction is usually much easier than a forceps operation.

Though the pelvic measurements are of great importance they are only one of several factors to be considered in the management of a woman with an abnormal pelvis. Her race and bony development and that of her husband's must all be taken into consideration. Distortions of the lower uterine segment caused by marked rotation of the uterus, angulation of the uterus or abnormal reflexion of the fascias so frequently found in cases of contracted pelves and which cause malposition of the child's head, are very important factors in the management of such cases. I believe that the correction of these conditions by external manipulation, hinders and posture so as to make the head fit squarely into the brim of the pelvis, is not emphasized enough in our teaching of obstetrics.

When there is distinct disproportion between the child's head and the bony pelvis, cesarean section is of course indicated as the operation of choice and the perfection of the low operation has extended its usefulness in cases where, after prolonged labor, there is still bony obstruction. A child's head which will not come down as a vertex is not likely to come through by breech extraction; however, when the failure to advance is due to the misdirected forces on account of malposition rather than bony obstruction, and when the soft parts have been eliminated, there is still place for version and breech extraction or for the use of forceps. In such borderline cases when the question of dystocia can only be determined under deep anesthesia, preparations should be at hand to perform a cesarean section if necessary without unnecessary delay for, in many cases forceps and version and breech extraction have been attempted because of lack of preparations. We have had no maternal mortality in our cases of version and breech extraction or in the few cases of high forceps which we have done (19 in

4,000 deliveries) whilst the maternal mortality for cesarean section is nearly 2 per cent.

Our results from induction of labor in contracted pelvis were so unsatisfactory that we very seldom use induction in contracted pelvis cases.

DR. WM. C. DANFORTH, EVANSTON, ILL.—The point which Dr. Burgess made regarding the great importance of prenatal examination is one which cannot be too greatly emphasized.

I have resorted to pushing the head into the pelvic inlet in order to determine whether or not the head would be likely to pass through, in our relatively contracted cases, but have not come to have quite the same confidence in it that Dr. Burgess apparently has. It is true that it will give us an idea as to the relative size of the head as compared to the pelvis at the time at which the examination is made but it cannot tell us the degree of molding which we may expect and upon this depends in many cases whether or not the head may pass through.

I agree entirely with Dr. Burgess' idea in regard to the management of cases of relative contraction so far as the labor is concerned. We have been accustomed to deliver those cases in which it seemed certain the head would not pass through the pelvis by cesarean, using in these elective cases the classical section. In the borderline cases we usually try a test of labor and this can be more effectively tried since the perfection of the cervical section which permits us to give the patient an adequate trial of labor. Our experience with this operation has been limited because our results with these cases have been quite like those Dr. Burgess has spoken of; that is, 80 per cent of our relative contractions deliver spontaneously or at least without the necessity of any abdominal interference. Our recoveries after this operation have been very satisfactory.

Our experience with version in the contracted pelvis corresponds with that which Dr. Burgess has described and we are not inclined to favor it.

As to the induction of labor in contracted pelvis, I am not quite as enthusiastic as the essayist. I take it that the primary reason for pregnancy and labor is that a baby may be born which is not only alive but which may be brought up. It requires very careful judgment when induction of labor ahead of term is used not to obtain a certain percentage of babies which by reason of prematurity are compromised. We prefer therefore particularly in primiparae to allow labor to begin, using abdominal section in the minority which do not deliver normally.

Dr. Burgess emphasized the value of a simpler classification of contracted pelvis. I agree thoroughly with this, and the simpler classification which he gives us would be far easier for the average practitioner to keep in mind and would be easier for students to learn.

DR. L. G. CONN, EDMONTON, ALBERTA, CANADA.—I think as Dr. Burgess does about the classification of pelvis, for many students cannot learn the ordinary classification and when they go out they never make any attempt to follow it. They steer clear of contracted pelvis and the result is that many of these cases are not recognized and are not handled as they should be and after all, the proper handling is the diagnosis early in the case.

DR. JOHN O. POLAK, BROOKLYN.—A point which might probably be further emphasized, is the study of the individual patient, not only for stature, but for other conditions. There are so many simple observations that suggest contraction: for instance, the length of the forearm, the shape of the thromboid, etc.

As to fitting the head into the pelvis, it is not well understood what he really means by that. That can best be done, and should always be done where the

decision is to be made between the infra- and supravaginal delivery, with the patient under an anesthetic, with the whole hand in the pelvis.

Another point of importance is the incidence of craniotomies. Gradually in the East craniotomies have dropped out of use except in some of the larger clinics, and yet there is no operation that means so much to the mother in these neglected cases that are potentially or frankly infected. I believe it is far better to do a craniotomy in those frankly infected cases than it is to take the risk of abdominal section.

DR. W. H. VOGT, St. Louis, Mo.—I want to endorse practically everything that Dr. Burgess has said, chiefly his method of classification; likewise his very excellent method of treating contracted pelvis.

So far as the test of labor is concerned, I am always reminded of what my old teacher, Professor Leopold, used to say, that whenever you decide to do a high forceps, don't carry the forceps in your pocket but go home and smoke a cigar and in the meantime, when you come back, perhaps the baby will be born. This is true in many cases of so-called contracted pelvis cases; we are often surprised to find the baby born. Only recently I saw a normal delivery occur when an operator was getting everything in readiness to do a cesarean section. We are frequently surprised to see what the forces of labor will do even in severely contracted pelves.

The baby, too, should be considered as well as the contracted pelvis and I think that is a thing that we are overlooking right along. I know the attempt is not generally made to obtain an exact idea of the baby's head. Personally, I believe one can get a real idea as to the baby's head in relation to the pelvis, when proper measurements are made, but when we speak about the moldability of the baby's head, we speak of something we know nothing about. I do not believe any of us know whether a baby's head is going to mold into the pelvis or not; therefore, I believe it is necessary to know what the size of the head is in relation to the pelvis. I am convinced that we can obtain very reliable working ideas of the size of the head by external measurements as advocated by Perret some years ago. I have been practicing that method and after considerable experience find that the difference between the estimated and the true biparietal diameters does not vary over three-quarters cm.

I am likewise convinced of the fact that there is such a thing as a postmature baby, even though it is generally denied. Some tell us that babies who weigh over eight and a half pounds, are suffering from hypothyroidism. If that is a fact then there are a lot of hypothyroid babies born. I am sure that we are no longer proud of bringing big babies into the world. We used to go around boasting of nine and ten pound babies; but now we are rather ashamed to admit that, for large babies are usually delivered at the expense of the mother's health and welfare and often sacrificing the baby's life.

DR. BURGESS, (closing).—As regards Dr. Danforth not having satisfactory results by a pelvic examination under an anesthetic, all I can say is that we have found it of the greatest benefit. I attempt manually to engage the head in the pelvis, and when it is a tight fit to wait for a period of six or seven days and then induce labor.

We never think of inducing labor unless we feel that we have an excellent chance of getting a living, viable child; but when you have a borderline case, with a patient two or three weeks from term, the giving of pituitrin and castor oil, or the putting in of a bougie (which I prefer to a lug) recommends itself as a reasonable operation.

DR. THOMAS J. WATKINS, of Chicago, Ill., read a paper on **Vesico-vaginal Fistula.**

Dr. Watson advocated thorough dissection of the anterior vaginal wall in the operative treatment of cystocele and called attention to the importance of noting the retraction and fixation of the injured tissues. He believed that a hopeful prognosis was possible in many cases where the vesical sphincter seemed irreparably damaged and presented a plan for obtaining adequate mobilization. In vesicovaginal fistula the tissues retract and become fixed in much the same manner as in ventral hernia and this is most pronounced in urethral injury. Deep lateral dissection is therefore necessary to obtain mobilization. Separation of the bladder from the cervix by blunt dissection is necessary only in exceptional cases. The latter is especially valuable when the fistula involves the cervix and is essential if a maximum amount of mobilization is desired. Incision and ligation of the broad ligaments can also be utilized for releasing the upper part of the bladder. This does not endanger the urethra as would extensive lateral separation of the bladder and tends to lessen the probabilities of shortening the vaginal canal. Dr. Watkins prefers closure with silkworm-gut in the form of mattress or figure-of-eight sutures or a combination of these. Tissues about all infected fistulas are not suitable for closure with buried sutures and primary union is of vital importance to the patient. In cases of involvement of the vesical sphincter deep lateral dissection and firm closure is especially important to obtain urinary continence and prevent retraction.

DISCUSSION

DR. J. WESLEY BOVEE, WASHINGTON, D.C.—I thought I had made some quite broad dissections, but this is beyond anything I have done. I am somewhat at a loss to see what the advantages are of separating the broad ligament from the cervix, unless it might be in a patient like the woman I operated upon a year ago, who weighed 240 pounds, was 68 years of age; the uterus had been removed twenty years before for cancer and the bladder had been opened and sutured, but failed to unite. Subsequent operation to close the fistula was a failure. I had great difficulty in closing the fistula. At the end of twelve days she had leakage of urine and there still is some leakage. Here I believe we should get benefit from a broad dissection of this character.

As to the sutures used, I think I have had better success with chromic catgut than with silkworm-gut. In my work I have entirely discarded everything but catgut. I used kangaroo tendon for many years, but I have not used silkworm suture for a long time, chromic sutures seeming to fill the requirements.

MAJOR P. F. GOW, IND. MED. SERVICE.—In many places in India the practice of obstetrics is still primitive and my fistula cases come not from Calcutta but from the Hills of Assam and out-lying districts where women may continue for several days in labor without any skilled assistance—the result being frequently a big vesicovaginal fistula. Further, I see many cases years after the fistula has developed and after the patient has had one or more operations without cure. This brings me to emphasize one point brought out by Dr. Watkins,—the necessity for proper instruments. These are easily procurable in America, but not always immediately available in India and I frequently find a previous operation has been attempted by a Mission Doctor under the best conditions at hand, but without proper instruments,—the result being imperfect closure, an excess of cicatricial tissue and very little healthy tissue available for a subsequent operation.

The next important factor adequately mentioned by Dr. Watkins is the free mobilization of the flaps. I have never had occasion to go as far as he has, but

the dissection must be extensive enough to allow the flaps to fall together without traction. Unless that is done there can be little hope of successful closure.

My own experience as regards the material for suture of the bladder wall has been that there is nothing as useful as silkworm-gut. To it I attribute mainly the success I have had in dealing with persistent leakage of urine where the cases have been operated on several times previously. I am very careful not to go through the mucous membrane of the bladder but only through the muscular wall, thereby leaving no nucleus for a urinary calculus but securing apposition to the edges of the opening in the bladder until firm union has occurred. I have not used chromic catgut, but have not found ordinary catgut satisfactory for this purpose in India. I noted that the catgut sutures in the vagina sloughed out within seven or eight days and in the bladder about the same time, so that although the operation gave promise of success for the first week, a leakage of urine occurred about the ninth day, whereas complete and successful closure followed the use of silkworm-gut.

I have found it beneficial to leave in a selfretaining catheter for 10 to 12 days and to wash out the bladder at regular but increasingly longer intervals.

DR. DOUGAL BISSELL, NEW YORK.—The simple principles introduced by Marion Sims in the cure of fistulae have served my purpose with uniform success during the past thirty years and I judge that the cases met with by me could not have differed greatly from those operated on by my colleagues during this time.

In the early days of gynecology, a time when the only surgery done was that for the repair of vesicovaginal fistulae, a time when there came to Sims from every part of this country and from foreign lands, cases as the records show, of every conceivable form of vesicovaginal fistula, we marvel at the dexterity our great teacher used in applying his simple principles; for his successes, as shown by the old records still preserved, would do credit to the master surgeons of today. I therefore plead for the application in general of these old simple principles in the repair of vesicovaginal fistulae and would reserve the more complicated principle of mobilizing the bladder for those cases where it is particularly adaptable. I believe, we can adopt and it is applicable, as far as I know, to every form of case unless it be the type of case that Dr. Watkins describes. This simple type can be cured without any more complicated procedure than that devised by Sims many years ago.

DR. R. M. RAWLS, NEW YORK.—Some years ago when I devised an operation for cystocele I was criticised for the extensive dissection, and was accused of doing a major operation for a minor condition. I am not going to make that accusation of Dr. Watkins, for it seems to me that in some cases where there is a destruction of the sphincter control of the bladder, such an extensive dissection as Dr. Watkins has pictured is of service. The sphincter control of the bladder is due to two muscular elements; the first is the reduplication of the muscular fibres around the neck of the bladder; the second is the action of the compressor urethra in the female.

I have rather questioned the existence in the female of the compressor urethra, but after seeing Dr. Hirst's very careful demonstration, I now appreciate the importance of its restoration.

I cannot agree with Dr. Watkins as to the line of cleavage. In cystocele I find the proper line of fascial cleavage by cutting in the midline and not off to either side as shown in Dr. Watkin's slides. The bladder can be freely separated from the fascia and remains attached only to the uterus. Then by cutting the so-called uterovesical ligament the bladder is freely mobilized even above the peritoneal

fold except for a few fascial fibres of the retinaculum of Mothri. Therefore, I cannot see the necessity of cutting or separating the broad ligament.

DR. CAREY CULBERTSON, CHICAGO, ILL.—Two points I wish to bring out: The operation as described and the pictures indicate that it is applied to the fistula that results ordinarily from obstetrical trauma. Today vesicovaginal fistulae are due as often to postoperative trauma as to obstetrical trauma. In my experience, which is similar to that of Judd, about 50 to 60 per cent of fistulae are postoperative, secondary usually to hysterectomy. The fistulous tract is usually further back in these cases, and there are certain other changes which are secondary to the preceding operation, such as the absence of the uterus, and displacement of the ligaments, —not only of the broad but of the round ligaments. If we have not performed the previous operation ourselves, we do not know where these ligaments are. The point I wish to make is that the method of dissection described by Dr. Watkins is admirably adapted to the closure of postoperative fistula.

My second point is that in preparation for the closure of vesicovaginal fistula cystoscopy should be universally employed and the charted picture of the interior of the bladder incorporated in the case history. This can be done immediately before operation for closure or some time previously. This is particularly important in postoperative fistula for the reason that the lesion is apt to be close to the ureteral orifice and the orifices, of course, are more apt to be involved in the closure of the fistula if their exact location is not known.

DR. GEORGE GRAY WARD, NEW YORK.—Dr. Watkins calls attention to the great benefit, as far as procuring mobilization is concerned, of dissecting the fascia high up on either side of the urethra.

My fortune, or misfortune, has been that I have not always been able to apply the operation of Sims where I would be inclined to do it perhaps, on account of getting cases that have had repeated previous operations, where the wall of the vagina and bladder were extremely thin, thus making it difficult to get a broad enough surface for a beveled approximation without some tension.

I wish I could say that I never have had a failure.

I can bear out what Dr. Culbertson says about the frequency of operative injuries, and they are usually of the inaccessible type. I contributed a paper before this Society on inaccessible fistula and laid down some principles which would facilitate the closure, and in that procedure the same wide separation of the bladder from the vagina and the uterus is an essential point. I have also brought out the point of using the Schueardt incision which greatly facilitates the approach.

I think failure to reduce tension is due more often than anything else to not having proper mobilization. If there is tension around the injury, you will fail, no matter what kind of suture material is used.

DR. WILLIAM R. NICHOLSON, PHILADELPHIA.—I was particularly interested in the statement of Dr. Watkins that the fistula did not destroy the sphincter of the bladder, because I have unfortunately just had two cases in which the whole urethra had been entirely destroyed, leaving a hole about as large as a quarter of a dollar, in the bladder, close to the cervix. I attempted in one case a reconstruction of the urethra, with the idea of making mechanical pressure upon it by some variety of pessary, but failed to do more than contract the opening in the bladder and gain a certain amount by the use of the anterior lip of the cervix. In this case the introduction of a hard rubber ball pessary enables the woman to be a little more comfortable than she previously has been. Cystoscopic examination in this case showed the ureters so distorted in position that any attempt

to close the fistula with the hope of getting sphincteric control was obviously, useless.

The other case was a woman with absolute urethral destruction, the etiology of which was very obscure, probably due to syphilitic infection. She also had a tremendous abdominal hernia and was extremely fat. In her case I suggested the establishment of a permanent pessary and the wearing of a receptacle.

These two cases present extremely unfortunate conditions. It will be remembered that Drs. Noble and Kelly, and also Dr. Goodall each reported cases of this type, in all of which mechanical support had to be used after they had reconstructed the urethra; and also that Dr. Emmett had an experience with five of these cases, with very unsatisfactory results. In neither of my cases was the very interesting procedure of Dr. Ward possible of performance.

DR. GUY L. HUNNER, BALTIMORE.—I should like to know what Dr. Watkins' attitude is toward a vaginal hysterectomy in some of these extensive cases. I am always rather glad if there is some good excuse for going ahead in very severe cases and doing a total hysterectomy. It gives a better mobilization, of course, and a better chance to bring the vaginal tissues up against the bladder without the danger of dead spaces that so often develop a little leakage.

I prefer to close the first layer with plain No. 2 catgut. I believe the chromic gut sometimes lasts too long and is liable to favor infection. I make bladder closure first with catgut, because this is so pliable and you can use small needles. I always test the suture line with intravesical pressure after making the first closure of the bladder wall, sometimes making a double row closing over the first row; I am not particular whether the first row of sutures passes through the mucosa of the bladder or not. Then in the final vaginal closure I prefer pure silver wire. You can get that in smaller strands than the ordinary sterling silver wire which we have in the usual operating room equipment. The sterling silver is a little more apt to break than is the virgin silver wire. With the latter you can regulate the amount of pressure on the tissues.

DR. WATKINS, (closing).—The size of an abdominal incision has been standardized and is no longer a subject for serious discussion. It is made large enough to obtain good exposure and to permit of easy work. The amount of dissection for vesicovaginal fistula should meet the same requirements, and especially to obtain free mobilization.

The amount of traumatism suggested by the incisions of the broad ligaments, is much less than would be expected. When the cut ends of the broad ligaments are sutured together in front of the cervix no deformity should result and no injury to the supports should obtain.

I appreciate Dr. Nicholson's remarks, but still believe that continence can often be obtained in cases where the vesical sphincter seems to be irreparably damaged. The sphincter, like the sphincter in complete laceration of the perineum, is generally not so much destroyed as it is retracted and fixed.

I am glad Dr. Hunner spoke of the amount of mobilization of the bladder which results when hysterectomy is done, because complete separation of the bladder from the cervix and incisions of the broad ligaments as described give the amount of mobilization noted.

DR. GUY L. HUNNER, Baltimore, Md., presented his paper **End Results in One Hundred Cases of Ureteral Stricture.**

This report was based on the first 100 answers received from questionnaires sent to the author's first 300 patients treated for ureteral stricture, between 1910 and 1918 and at least five years had elapsed since treatments ceased. The analysis

of the clinical features as summarized from the records and from the questionnaires, gives one a fairly clear picture of the symptoms associated with ureteral stricture and of the results that may be anticipated from treatment.

That this disease has been overlooked in the past is evidenced by the past records of operations in this group of cases. Of these 100 patients 71 had records of 109 operations, 38 of the patients reporting 56 operations with total or partial relief of the symptoms for which operation was done, and 33 of the patients with 53 operations reporting no relief to symptoms.

The most common operation for symptoms due to ureteral stricture is that for supposed appendicitis. Thirty of these patients had been operated upon with the sole diagnosis of appendicitis, 28 for chronic appendicitis and two for the acute condition. Of these, four reported complete relief from symptoms, nine partial relief, and seventeen no relief.

Pain in the back was a complaint in 97 instances, and this was completely or partially relieved after ureteral treatments in 69 instances, or in 71 per cent of the cases. Pain in the lower ureteral region was recorded in 93 cases and relieved wholly or in part in 70 instances or in 75 per cent. Bladder symptoms were recorded in 79 patients and they were completely or partially relieved in 63, or in 80 per cent.

The most frequent gynecological complaints associated with ureteral stricture are dysmenorrhea, "falling of the womb," ovarian neuralgia, and dyspareunia.

Gastrointestinal symptoms are among the most frequent and most distressing complaints of the ureteral stricture victim. A table showed the incidence of such symptoms as indigestion, anorexia, nausea, gas, diarrhea, rectal pain or pressure, and mucous colitis, and the percentage of relief obtained by the ureteral treatments.

Headache was a symptom in 54 instances and this was totally or partially relieved in 38 patients, a percentage of 70.

Pain in the hip was a complaint in 61, and pain down the leg in 51 instances, these localizations being duplicated in many patients. Fifty-five of these patients were totally or partially relieved.

The final item in the questionnaire, requesting that the patient classify herself under one of four headings, yielded the following result: (a) cured, 29, (b) much improved, 50, (c) improved, 15, (d) not improved, 6.

DISCUSSION

DR. JOHN G. CLARK, PHILADELPHIA, PA.—It is with especial satisfaction that I have heard Dr. Hunner's review of his results in 100 ureteral stricture cases. Dr. Hunner speaks of the fact that his failure up to date in giving such a resume has made him a target for criticism. As one of his friends, I confess that I have been one of those obstinate spirits who possess the Missourian spirit, "show me." A stricture in any other channel is a definite entity and possesses such diagnostic symptoms as to leave little question as to its presence. Looking back to one's internship days, we recall the spasmodic or well nigh impermeable stricture which resisted all attempts to pass a catheter, and finally gave way only on passage of a filiform bougie. All grades of these narrowed channels have come under our observation since, but the difficulty was always in getting beyond the stricture by frontal attack. Therefore, it is so difficult to synchronize these observations with Dr. Hunner's assertion that a wax-tipped bougie may pass all right but is caught in retrogression. I have been prejudiced not against but in favor of Dr. Hunner's work, for he has carried into it such enthusiasm and indefatigable energy and is so desirous for us to see the light that I am really anxious to be con-

verted. My associate, Dr. Floyd E. Keene, who has full charge of this work in my department, has approached the problem in this same spirit, for we cannot help but feel there is something decidedly of value in it. Possibly were Dr. Hunner to compromise in some other term than stricture we might agree more readily. We all are in accord with his assertion that daily all over the country patients are having all sorts of pelvic and abdominal operations for symptoms such as he ascribes to this form of stricture, with of course no relief whatever. Therefore, to define this condition and to devise a plan of treatment for relief is indeed a service to womankind. In this instance, however, one wonders whether the remedy is not more painful than the disease. Could such a plan be carried out successfully in one or at most a few treatments it would be worth the effort, but so many of these women have already become neurotic, and I fear that those who undergo this plan unsuccessfully will be plunged into the hopeless mire. This type requires the attitude of the neurological surgeon who must put many patients through severe ordeals to garner a relatively small number of final cures.

One cannot, however, discuss this subject lightly, for I feel that back of this work there is a very definite pathologic entity, which in a certain number of cases is finally relieved by his plan of treatment. Every one of us who deals with cystoscopic cases should be very alert, and when possible follow Dr. Hunner's advice in these obscure cases, whether we call them strictures or something else. I feel personally grateful to Dr. Hunner for this report of his cases, for he has put his cards upon the table, and while many of us may not be in full accord with him as to his interpretation of a stricture, we can at least assure him that we have not cleared up as many of these hitherto painful lesions as he has recorded today.

Will Dr. Hunner please mention how often he has been able to demonstrate by pyelography a stricture of the ureter?

DR. GUY L. HUNNER, BALTIMORE, MD.—My paper deals with those cases operated upon since we ceased our ureteral treatment, and some were operated upon during the course of ureteral treatments. Yes, I have many such pictures.

DR. HIRAM N. VINEBERG, NEW YORK.—I should like to ask whether it is Dr. Hunner's experience that most of these cases of stricture occur on the right side? Obscure pain in the right side of the abdomen is very frequently met with in women. Often the appendix is taken out and is found to be normal. Some small cysts of the ovary are excised or perhaps the entire ovary is removed, but the patient continues to complain of the pain she had prior to operation. If stricture of the ureter is a cause of obscure side pain in women, then it would appear to me there should be a marked preponderance of stricture of the right ureter.

DR. CURTIS F. BURNAM, BALTIMORE.—I think Dr. Clark is wrong in not being able to conceive of stricture where there is not a stoppage of the entire ureteral cavity. You often get a big stricture in the rectum with inflammatory infiltration all around, which destroys the musculature of the bowel, or of the esophagus where there is great difficulty in swallowing, not so much with fluid as with solid things. The pelvis of the kidney normally does vary from 1 c.c. capacity probably up to 20 c.c., so it would seem quite certain that strictures which were really periureteral inflammations would permit the catheter to go through and would cause pain and yet not lead to hydronephrosis.

I have personally seen a number of cases primarily which I have sent to Dr. Hunner for treatment and they have apparently gotten entirely well.

DR. DOUGAL BISSELL, New York, discussed the **Surgical Treatment of Renal Papillomata and Ureteral Implants in the Female**, and presented a case report.

A young woman, thirty-one years of age, who had previously enjoyed perfect health, developed a profuse hematuria lasting several days. Urological examination showed the right kidney to be the probable source of disease,—nephrectomy with partial ureterectomy was performed and the pelvis of the kidney was found filled with papillomata crowded into the upper ureter but not growing from the ureteral surface. The vesical orifice of the ureter showed no evidence of papillomatous involvement. Eight months after nephrectomy, hematuria again occurred,—examination then showed a papillomatous involvement of the right vesical orifice. The entire remaining portion of the ureter was now removed transperitoneally and transvesically by a new technic the advantages of which were: directness of approach,—opportunity afforded to contend with pelvic complications,—ample vision and room in which to manipulate with the exactness not afforded by the retro-peritoneal approach.

The case was reported chiefly with the object of emphasizing the important relationship between a primary renal pathology of a papillomatous character and subsequent similar developments along the urinary tract and that when there exist primary renal papillomata with no evidence of ureteral involvement, these questions arise: Should nephrectomy with partial ureterectomy be done and evidence of ureteral involvement awaited before ureterectomy is completed or should nephrectomy be done followed by the removal of the remaining portion of the ureter at the earliest possible date; or, should nephroureterectomy be done immediately?

The study would seem to show that manipulation of the kidney at time of operation tends to dislodge particles of the papillomata which may be included in the ureteral tie and become implanted when this organ is severed and partly removed.

It is probable therefore that implants occur from above downwards and never from below upwards unless by continuity, therefore the urinary tract below the primary growth is peculiarly subject to this form of metastasis. When renal papillomata occur the ureter of the affected side seems more susceptible to secondary involvement than does the bladder, and is usually affected prior to it. Implants may occur anywhere along the ureter but are more liable to occur where there is a retarded flow, as at the vesical orifice, or at points of injury, as when the ureter is severed and tied on partial removal. We are not justified in concluding when nephrectomy is contemplated for renal papillomata, that the ureter is in its entirety normal because its vesical orifice seems not involved. As the ureter is susceptible to implants from the moment the primary growth above begins to throw off particles of itself, it should be considered a harbinger of danger, and as the ureter, under these circumstances, is a probable pathological entity it is advisable to remove it *in toto*. If the ureter is not completely removed at the time of nephrectomy, its remaining portion should be removed as soon as the patient's condition permits. The best method of removing completely the remaining portion of the ureter is by the combined transperitoneal and transvesical route.

DISCUSSION

DR. J. WESLEY BOVEE, WASHINGTON, D. C.—This is a new departure in surgery of the lower end of the ureter and certainly not without its merits. While I have never attacked the ureteral orifice by this route, yet I can see that it gives a clear field of vision for carrying out the work. Dr. Bissell realizes with us, I

think, that had he made his dissection broader at the first operation, the second one would have perhaps been avoided. But that is an after thought. It seems to me, however, that to cross the peritoneal cavity to deal with a disease that is considered malignant in the kidney is an additional and unnecessary danger, that such procedure should be done extraperitoneally, and I think in this case an early operation done extraperitoneally, removing the ureter as well as the kidney, would have been completely successful.

In 1909 I read a paper, which was published in the Journal of the American Medical Association, section on Obstetrics and Gynecology, describing an operation I devised, the technic of which was something as follows: Splitting the anterior vaginal wall over the site of the ureter. The ureter was separated, the whole of it removed from the bladder, or it was severed at the outer surface of the wall of the bladder, whichever seemed feasible. Then it was easy to free the ureter through the broad ligament, which is the only part at which it is notably fixed throughout its course, the artery behind the vein being easily lifted up. By making an incision, a transverse lateral abdominal incision, (Korrig's) about $1\frac{1}{2}$ inches below the last rib, not entering the peritoneum, the kidney was easily reached, the artery severed, and a finger dissection easily separated the rest of the ureter which allowed pulling up the whole specimen through the abdominal opening, which was then closed either with or without drainage. In some cases I pushed a piece of gauze down through the pelvis to that portion of the tract from which the ureter had been removed, bringing it out through the vagina; in others I closed without drainage, and in no case was there drainage through the abdominal incision.

With this procedure I think one can remove a large amount of the bladder wall that had been previously demonstrated by the cystoscope to be involved; and if that did not suffice I am now conjecturing that incision through the vaginal septum would give us a view of the diseased area and permit resection of that portion of its membrane. I have not done that, I am only suggesting it. We know that we do expose portions of the ureteral orifice and the bladder oftentimes in that manner, and we sometimes see the ureteral orifice through vesicovaginal fistula openings. If the case is essentially malignant, one would have to be more careful of resections. I think in all malignant diseases of the kidney the ureter should be removed, but if there is much involvement of the bladder it is probable that a suprapubic incision would have to be made which can be made extraperitoneally and resection of the bladder done.

DR. JOSEPH B. DE LEE, CHICAGO.—Just a few words about the etiology of the so-called strictures in Dr. Hunner's series of cases. At autopsy it is not uncommon to find smaller or larger hemorrhages in the broad ligament around the ureter, especially near the bladder, in a woman who has died a few days after delivery. They are particularly common after forceps deliveries or very difficult spontaneous deliveries, and I would judge after the modern pituitrin deliveries.

Women after delivery often complain of backache and frequent urination. I have often thought that these symptoms were due to dislocation of the ureter and partial obstruction due to kinking, if not due to fibrous thickening of the base of the broad ligament.

DR. WILLIAM C. DANFORTH, EVANSTON, ILL.—Tumors such as Dr. Bissell has described occur more often in the practice of the urologist. I have seen two, in both of which we were fortunate enough to get autopsies. The first was treated by lumbar nephrectomy and subsequently by radium treatment of the secondary tumors of the bladder. The second case was too far advanced to do anything

more than a very rapid abdominal exploration. In both of these cases there were multiple tumors in the bladder. On the basis of the operative experience and the autopsy findings in both of these cases it seemed to me that the procedure of choice would be nephrectomy with complete removal of the ureter, which should preferably be done transperitoneally, provided the kidneys were not infected.

This leads to the question of treatment of the multiple tumors in the bladder. I would like to suggest in that connection, as a substitute for the rather radical surgical dissection, the application of a procedure which our urological friends are using,—electrocoagulation, which has been giving some very favorable results and which in some of these advanced cases of bladder tumors in connection with growths in the kidney, might be found very valuable.

DR. HUNNER.—It would seem from the report of the last speaker on Dr. Bissell's report, that it is not rare to have implants take place down the ureter, and if this is so, as is shown by repeated reports of the fact, we should certainly always do a nephro-ureterectomy. I am decidedly in favor of doing ureterectomies, even the secondary variety which Dr. Bissell has spoken of, extra-peritoneally. There is no trouble after you have pulled up the ureter in entering the bladder, you don't have to dissect the whole bladder wall to get a good wide opening.

Dr. Clark I think has a great many others feeling as he does, that I have painted almost too optimistic a picture of the results we get by dilating the ureteral stricture, and I think they have in mind when they think of stricture, a stricture in the male urethra. There is a vast difference in the two conditions, the male urethra having the large corpora around the urethral tube favoring a tremendous mass of scar tissue, while on the other hand there is practically nothing but reticular tissue around the female ureter, and it seems logical that after treatment it would at least remain well dilated, or dilated enough for good drainage, far more readily than in the case of the male urethra.

Not much can be said for this work in extenuation for the amount of pain caused. The pain is not the fault of the use of the waxed bulb as I use it for dilating strictures. You get the same pain after the first treatment if you pass a plain catheter. The patient has pain because she has a stricture and anything that traumatizes it gives a little extra edema and pain results. I am running through 100 cases now, passing a plain catheter with the first treatment, and am getting the same proportion of complaints as in passing the small bulb.

The point raised as to many of these patients having an underlying neurosis is a very good one. Many of them I do refer to the psychiatrist and neurologist in the early part of the treatment, but it is surprising how many of them who look hopelessly neurasthenic, in the long run gain weight, get good appetites, good digestion and become able to take hold of life like normal people. It is perfectly surprising how some of these wrecks from past multiple operations make splendid recoveries.

To Dr. Brettauer I would say, yes I use the pyelograms daily. I have some hundreds of these pictures of strictures. I spoke last night about the misinterpretation of these plates. The x-ray man fails to see the little area down in the lower portion of the ureter where the ureter begins to dilate slightly.

In reply to Dr. Vineberg's question, these strictures are practically all bilateral. The majority of them have more trouble on the right side, probably because of the frequency with which they have an associated appendicitis. The appendix inflammation may spread across the peritoneum and start pain in the stricture, whereas the left side would not be so readily affected.

Dr. Norris asks about postmortem findings. We are working on the subject of the pathology of stricture now. I have had to do a certain number of extra-peritoneal exposures and it has given me abundant opportunity to study the thickening in the ureteral wall, which is sometimes so thick that you think there must be a stone.

DR. JOHN G. CLARK.—What are the results in the retrograde work?

DR. HUNNER.—They are just the same as they are with the bladder route. You get a wider dilatation through the retrograde route while the patient is under anesthesia, but there is a tendency to subsequent contraction. This can later be treated through the bladder, but in one case I had to do the retrograde dilatation the second time before I could finish the work by the bladder route.

DR. BISSELL (closing).—Each man works best according to his experience and vision. Genitourinary and general surgeons do not operate on the pelvic organs of the female to the extent that gynecologists do, therefore they are not as familiar with pelvic pathology in the female. This familiarity with the intraabdominal work in the female should make the gynecologist the more appreciative of the directness of this route and the opportunity afforded him by it to cope advantageously with such pelvic complications as commonly are encountered in the genital organs of the female. Drs. Kelly and Dove have on several occasions pursued the vaginal route in removing the terminal or vesical portion of the ureter but this route as demonstrated by them offered certain objections which are insurmountable. The pathology in this case as determined by Broder is a renal papillomata, malignant, group 2. In that the surgical work was done with seeming completeness and that the group in which the case falls is No. 2, we should feel encouraged in regard to prognosis. The patient has been receiving x-ray treatment since the last operation and all examinations so far are satisfactory.

OBSTETRICAL SOCIETY OF PHILADELPHIA

MEETING OF FEBRUARY 14, 1921

THE PRESIDENT, DR. EDMUND B. PIPER, IN THE CHAIR

Symposium on Rupture of the Uterus

DR. EDMUND B. PIPER reported **Two Cases of Ruptured Uterus.**

1. Mrs. M. P. Admitted, Aug. 13, 1919. Two previous children. Confinement expected, Aug. 12, 1919. Family medical history negative. No miscarriages. First child, forceps delivery; second child, normal. Present labor long drawn out, patient had been given pituitrin, the amount of the dosage questionable. Upon admission with undelivered child she gave all the classical symptoms of a ruptured uterus. She was delivered by version before I saw her. Following delivery, examination showed large rent in anterior lower uterine segment. At operation the abdominal cavity was full of blood and blood clots. Anterior wall of the uterus was torn completely across leaving hardly an inch of cervix. The partial traumatic hysterectomy was completed and the stump peritonealized as well as possible. As the abdominal cavity had been contaminated from below, the patient was drained. Following operation, after which she was badly shocked, she made an uneventful recovery.

2. Mrs. A. P. Admitted Dec. 22, 1923. Age forty-three. Eight previous children. Previous labors all difficult. Patient had been in labor actively for over

twenty-four hours. Under anesthesia, delivery had been attempted, with failure, version was then tried unsuccessfully. Upon admittance to the hospital patient was semiconscious from ether and markedly shocked. Abdominal examination gave the appearance of the fetus very close to the skin. Version was completed with great difficulty as the fetal body had apparently protruded through a rent in the anterior uterine wall.

Operation: Following the extraction of the dead fetus abdominal section and hysterectomy was performed with no drainage. She was treated for severe shock, after which she made a surprisingly uneventful recovery.

DR. CHARLES S. BARNES reported two cases.

1. Mrs. E. P., Polish, twenty-seven years of age, of good family and personal history. A history of two pregnancies, spontaneous labors, two healthy children of five and three years respectively. Seen by the speaker, in her home, in consultation, March 14, 1923. A history of amenorrhea, the last menstruation occurring early in January, 1923. Menstruation habitually regular. No other history obtainable except that of two or three days of bleeding from the genital tract, indefinite pain in the lower abdomen and pelvis, and weakness.

Great pallor was evident, accelerated breathing, a rapid thready pulse not perceptible at the wrist, a subnormal temperature. Pelvic examination showed uterine signs of a two month's pregnancy, moderate tenderness and a visible moderate genital hemorrhage. The lower abdomen was somewhat rigid and tender and dull on percussion. A diagnosis of intraperitoneal hemorrhage was made, probably due to a ruptured extrauterine pregnancy. The patient was promptly transferred to a hospital and abdominal section done. The pelvis and considerable of the lower abdomen were filled with blood. The appendages were intact but a rupture or rent in the anterior wall of the uterus presented itself, so ragged and extensive as to necessitate supravaginal hysterectomy. The patient later admitted that the wound was self-inflicted. Deserted by her husband, and desperate in the thought of a third child to support, believing herself pregnant (which was true) she attempted self-induction of abortion by thrusting an ordinary hard rubber douche nozzle into the uterus. Evidently the nozzle, entering the cervical canal in the manipulation, had then been pushed through the anterior wall of the cervix into the peritoneal cavity, partially separating the bladder from its uterine attachment. One large piece of gauze was packed into the pelvis through the abdominal wound, to guard against hemorrhage, and, on its removal, to provide for the exit of probable infection.

The reaction of the patient was good, but her recovery, finally complete, was prolonged, due to local infection.

2. Mrs. A. B., Irish, thirty-two years old, in good health. On September 22, 1922, the patient was first admitted to the Philadelphia General Hospital six and a half months pregnant. Pains were present suggestive of threatened premature labor, but the predominant symptom was that of vomiting. After four days' observation and treatment the vomitus became dark green, pain was complained of in the right inguinal region and pain and tenderness under the right costal margin. The attending chief, deeming abdominal section imperative, found a cholelithiasis for which he did a cholecystotomy providing drainage which was continued for several weeks following. A six and a half months fetus was delivered by cesarean section. Needless to say the above treatment was at the hands of a competent man. Eight months subsequent to the above outlined treatment, May 29, 1923, the patient, admitted again to the Philadelphia General Hospital, came under the writer's care. She gave a history, borne out by physical findings, of a five and a half

months pregnancy, the seventh. The first five had terminated spontaneously at full time, the sixth as above cited by hysterotomy.

On admission, she had a normal temperature, normal blood pressure, a pulse of approximately 100, a hemoglobin of 60 per cent. The patient gave a history of having had for several days, beginning a week previous to admission, "smothering spells" with vague occasional slight abdominal pain; of having been seized two days before admission with tenesmus of the bowel and bladder, accompanied, while on the toilet, with acute pain in the pubic region. When admitted, very moderate irregular pains in the lower abdomen were complained of, and there was slight tenderness in this area. An incisional hernia appeared above the umbilicus.

No evidence of fetal life. Dullness was observed in the flanks. The patient at no time gave clear evidence of a serious condition, but during a few hours observation, the abdominal pain increased and the pulse became slightly accelerated. Abdominal section was done with a preoperative diagnosis of probable rupture of the uterus, possibly intestinal obstruction.

After removal of considerable free blood from the peritoneal cavity the uterus appeared with a longitudinal rupture of its anterior wall, four inches in length, clean cut, evidently a separation at the line of incision at the time of cesarean section. The intact amniotic sac inclosing the fetus lay free in the peritoneal cavity.

The previous operator informed me that he is accustomed to use several layers of catgut in closing the uterine wound. After removing thin strips of tissue, to freshen the apposing uterine walls, I closed the wound, as is my custom, with three layers of chromic catgut.

It seems that no infection was present following the primary operation to interfere with firm union of the wound. The most rational predisposing cause of rupture is doubtless the early occurrence of pregnancy, conception taking place two and a half months following hysterotomy.

Dr. NORRIS W. VAUX reported three cases.

1. Mrs. T. B., white, age forty-one. Admitted to Chestnut Hill Hospital, September 22, 1923. Diagnosis on admission: Pregnancy, ruptured membranes, not in labor. Para viii. Seven previous labors, one set of twins, seven children living and well. Patient had been attending the Prenatal Clinic, normal pregnancy. Patient admitted eight days after estimated probable date of confinement with early rupture of membranes. Labor began six hours after rupture of membranes. Fetal heart sounds heard on admission with difficulty. First rectal examination: Heavy, thick, gristly cicatricial cervix, dilatation three cm. Labor progressed until midnight (slowly) ten hours after rupture of membranes, pains increased in severity, regular three minutes. First vaginal examination: Cervix fully dilated, head engaged. Diagnosis: L. O. P., large firm head of overdue baby. Head did not engage well, one attempt at forceps delivery under ether was unsuccessful. Uterus was contracted firmly about child, head in occiput posterior position, easily pushed out of its engagement and difficult version performed. Large aftercoming head delivered by forceps. Baby stillborn. Weight 9.5 ounces.

Patient's condition excellent, some hemorrhage following delivery, uterus contracted well, moderate hemorrhage continued with firmly contracted uterus. Pulse rose to 120 ten minutes after delivery, it was noticed that the cord was retracting quite rapidly into vaginal orifice. Condition of patient showed early symptoms of shock. Twenty minutes after delivery pulse rose to 140, placenta removed manually from left side of abdominal cavity through a large circular tear above vaginal vault on left side, hemorrhage not excessive. Patient quite conscious, moderate shock, was treated for further shock and vagina packed. Forty-five minutes after delivery condition had improved, laparotomy was performed, easy rapid hysterectomy

followed. Patient left table in good condition, pulse 140 and of good quality, respirations 26, temperature 97.4, reacted well, no further hemorrhage. Pulse gradually rose to 160 at the end of twelve hours, no external bleeding or symptoms of hemorrhage.

Death followed thirty-nine hours after hysterectomy without further rally after transfusion, etc.; some blood clots and free blood in peritoneal cavity at time of operation.

2. Mrs. S., white, age twenty. Admitted to Lying-In Charity Hospital on October 22, 1923. Diagnosis: Pregnancy. Primipara, in labor. Small, rather pale young woman with a definite history of neisserian infection two years previously, followed by an illness lasting three weeks, at which time she had abdominal pain and tenderness of right and left sides, and pain in lower abdomen with difficult urination, purulent discharge, distention, with fever and vomiting. Slow convalescence about three weeks at home. No return of abdominal pain or distress, periods to time of pregnancy normal, pelvis small but normal, labor, twenty-six hours of normal first and second stage. Baby weighed 6 pounds, 5 ounces.

Two vaginal examinations made, placenta expressed spontaneously, temperature 97° after delivery, no postpartum hemorrhage, pulse 96, respiration 18. After two days of normal convalescence temperature rose to 102°, some foul, odorous lochia with pain in right side and definitely tender and enlarged uterus, marked on right side. On fifth day temperature reached 104, pulse 120, some vomiting and acutely tender over right side of uterus and pelvis, lochia distinctly purulent. On seventh day temperature went to 103, moderate sized firm mass felt at right side of uterus in pelvis, lochia much improved in character, patient's general condition about same, on tenth day mass had definitely increased rapidly in size, very tender and extended up right side on abdomen to level of umbilicus.

Vaginal examination showed no other areas of inflammation of pelvic masses other than sensitive uterus and mass on the right side connected with uterus, non-fluctuating. Laparotomy was performed on tenth day, large mass of omentum adherent to uterus, when gently removed, about six ounces of foul-smelling blood and pussy material evacuated. There was a distinct rupture or rent in right lateral anterior wall of uterus about three inches in length. Hysterectomy and uninterrupted convalescence.

3. Mrs. F. M., white, age twenty-one. Admitted to Bryn Mawr Hospital Ward on Jan. 16, 1924. Diagnosis: Ruptured Uterus. Primipara. History given by attending physician outside hospital that patient had had forty-six hours of labor with no advancement. After completion of the first stage he advised removal to hospital, this was refused. Forceps applied in home under poor and unsanitary surroundings. After several attempts child was delivered stillborn. Perineal lacerations. Afterbirth did not deliver and physician made attempt to remove it manually at which time he found the examining hand went well into the abdominal cavity through a rent in the left side of the vaginal vault. Patient was then sent to hospital in an ambulance with placenta retained.

On admission: Pulse 110, temperature 98°, respirations 24, moderate bleeding, symptoms of shock not marked, no attempt had been made to suture perineal laceration. Placenta removed manually. Diagnosis confirmed, vagina packed and patient treated for shock, condition became critical but responded to treatment. Twelve hours after admission condition of patient justified further procedure. Patient was prepared for section, etherized and packing removed. Thorough examination of birth canal made, revealed the following: Laceration of birth canal of severe magnitude, cervix was lacerated in many places but a large left lateral tear extended up into the abdominal cavity.

Immediate hysterectomy. The laceration extended on left side posterior to the broad ligament upward, about 3½ inches. Pelvis contained blood clots and some

free blood. Vaginal drainage placed. Patient reacted well from operation, convalescence has been quite normal with exception of inability to control flow of urine, patient was incontinent. At present time patient is recovering the bladder function. General condition is such that she could be discharged except for occasional incontinence of urine.

DR. CHARLES C. NORRIS reported three cases.

CASE 1. Illadvised forceps operation resulting in rupture of umbilical cord; deep tear in the myometrium prior to admission to the Philadelphia General Hospital. Easy forceps delivery, abscess formation, rupture of abscess on the 13th day and death from general peritonitis on the fifteenth day. Autopsy.

Mrs. E. Mac T., para xii; pains started at 11 P. M., forceps were applied one hour later; between then and her admission to the hospital at 6 A. M. the next morning, forceps were unsuccessfully applied three additional times. When seen by me two hours after admission, her temperature was 98, pulse 120 and respiration 40; general condition of the patient was worse than these figures would indicate. The pulse was of poor quality, the skin leaky and no fetal heart sounds could be heard. Examination showed a wide vaginal outlet and an L. O. A. position. An easy midforceps operation was performed and the placenta was manually extracted. A deep tear was found involving the right side of the uterus low down and extending outwards to, or nearly to, the peritoneum. No communication with the peritoneal cavity could be demonstrated. The infant weighed nine pounds, was dead, and the cord was torn off flush with the umbilicus, evidently the result of the previous attempts at delivery. Subsequent to delivery, the temperature showed evidence of mild pelvic peritonitis, but the patient seemed to be doing moderately well. This condition continued until the thirteenth day, when after moving in bed, she complained of sudden pain in lower right abdomen, followed by evidence of shock. General peritonitis developed and death occurred on the sixteenth day. Autopsy confirmed the clinical findings.

CASE 2. Mrs. M. G., para iii, in labor twenty-four hours and was finally delivered after considerable difficulty with forceps by family physician. The patient showed marked evidence of shock and on my examination two or three hours later, a large tear in posterior uterine wall which easily admitted the hand into the peritoneal cavity, was demonstrated. This patient was transported five miles in a Ford car to a county hospital where supravaginal hysterectomy and conservation of tubes and ovaries was performed, normal convalescence. The tear in this case was about 10 cm. in length and ran diagonally downwards through the posterior uterine wall. This case illustrates the amount of trauma to which pregnant women may be subjected and still survive. After her arrival at the hospital, her general condition was moderately good.

CASE 3. J. R. A cesarean section had been performed upon the patient two years previously at the Philadelphia General Hospital. She subsequently became pregnant and during labor, the uterus ruptured. The patient was brought to the hospital with the clinical signs of rupture and immediate supravaginal hysterectomy with conservation of tubes and ovaries was performed. This was followed by a normal convalescence. The infant weighed 7 $\frac{1}{2}$ pounds and was found with the placenta lying among the coils of the intestines. The membranes were ruptured. The scar from the previous cesarean section could be demonstrated as a thin razor-edged cicatrix on the anterior uterine wall. There was absolutely no thinning of the myometrium, and to all intents and purposes, the scar appeared to be an excellent one. The tear started at the upper limits of the cicatrix, followed this downward for about 1 cm., diverged to the right and paralleled the previous incision, leaving about 3 or 4 mm. of apparently normal muscle tissue between it and the old scar. His-

tologic examination in this specimen confirmed the above findings. There was no ingrowth of endometrium into the cicatrix as has sometimes been observed. This case is of interest because it demonstrates that even with good healing of the uterine wound, rupture may occur. Unfortunately we have been unable to ascertain what was the position of the child or whether pituitrin had been administered. The pelvic measurements were normal.

I have been able to follow four patients on whom I performed the high cesarean section and who subsequently became pregnant. The first of these was admitted to the Philadelphia General Hospital at about 6½ or 7 months of pregnancy, suffering from an acute cholecystitis. The usual palliative treatment was instituted for a few days but the gall bladder condition rapidly became worse, marked jaundice developed together with a high fever and all the indications of purulent cholecystitis. About this time, the patient developed symptoms of beginning premature labor, the cervix was thick and firmly contracted and delivery from below would have been difficult. Cholecystectomy and the removal of a gallstone from the common duct was performed, the gall bladder contained pus. On account of the condition of the patient, it seemed unwise to submit her to the added strain incident to premature labor, and for this reason, a cesarean section was performed prior to the gall bladder operation. Convalescence was complicated for the first week by a moderate elevation of temperature, and from that point, was normal. This patient subsequently became pregnant and the uterus ruptured. This is the case which has been reported tonight by Dr. Barnes. Whether or not there was good healing of the uterine wound, is impossible to determine, as the fever present during the first week may have been due to the gall bladder wound.

In addition, I have two cases of central placenta previa, upon which cesarean section was performed; one of these patients was delivered in Chicago last fall and wrote me that she had had an easy, spontaneous labor at term. The other I have delivered twice since her cesarean section, both times, however, in the hospital. Both labors were uncomplicated.

One other case is strongly impressed upon my mind, as it was the first cesarean section which I had ever performed, a rather elderly primipara with a large and firmly contracted cervix; she had a premature separation of placenta. A dead baby was diagnosed. Cesarean section was performed as a life-saving measure and was followed by normal convalescence. I subsequently delivered this patient in the maternity hospital and convalescence was normal.

DR. BARTON COOKE HIRST, then read a paper on the **Causation and Treatment of Rupture of the Uterus.** (For original paper see page 757.)

DISCUSSION

DR. EDWARD R. DAVIS.—So far as the recovery of the mother is concerned, the most favorable rupture of the uterus is through the fundus with complete escape of the child into the abdominal cavity. The reason for this is in the fact that if such an accident occurs and the alkaline plug of mucus in the cervix remains intact, it is possible for the woman to escape infection, and the chances of recovery are vastly better than if there is rupture through the lower segment. In a recent case a woman fell from a passenger elevator, breaking two ribs, injuring her breasts severely. She continued to do her own house work for eleven days after rupture of the uterus. Complete recovery resulted after operation. In that case the blood in the abdominal cavity, not large in quantity, was cultured and was sterile, so was the ruptured uterus and there was no evidence whatever of infection.

The most dangerous uterine ruptures are in the lower segment. Hemorrhage must occur because there is no adequate uterine retraction. Rupture of the uterus at

the placental site, is due to local autolysis and weakening of the uterine muscle. That brings up the question of spontaneous rupture: fatty degeneration of the uterine muscle in multiparae, insidious and accompanying partial separation of the placenta is not infrequent. In these cases one will find on the posterior wall a longitudinal rent several inches in length where the uterus has ruptured through its peritoneal covering.

To illustrate how difficult it may be to ascertain the precise cause of uterine rupture, in six instances there will be one in which no adequate cause can be found. Cases of especial interest are those of degeneration of the uterine muscle and especially those of necrobiosis, autolysis, and of complete rupture through the fundus with the entire contents of the uterus in the abdominal cavity, followed by recovery after prompt operation.

DR. RICHARD C. NORRIS.—The types Dr. Davis alluded to are of great interest, but they are not the kind of cases hurried into the hospital *in extremis*. As I look back on my experience spontaneous ruptures are very rare indeed. Hydrocephalus, neglected shoulder, a few such cases I can recall, but almost always it has been bad obstetrics. The symptoms of shock and hemorrhage are often misleading; if a woman is being operated on and under anesthesia the operator does not have these classical symptoms to go by. So I would like to stress that one point that the important pathologic changes in the uterus Dr. Davis has referred to have a bearing on the ruptured cesarean and have a bearing on so-called spontaneous rupture of the uterus. Spontaneous ruptures are rare, but they are becoming more frequent since cesarean section is being more frequently done. Danger of rupture is very much less operating on the lower uterine segment and is a distinct argument in its favor. The problem of rupture following cesarean: What are we to do for these patients? I am afraid to take care of a woman who has once had a high cesarean unless she is in a hospital, unless she is pretty close at hand in the last few weeks of pregnancy, on account of the insidious progress of these cases and apparent freedom of shock. The early incomplete ruptures were treated by tampons, but the man who will bungle, do version or forceps, is not capable of doing tampon treatment in a skilled way. Any case of ruptured uterus I was going to operate on I would first transfuse. I believe transfusion would have saved loss in the past and it is worth taking the chance of transference of the patient to the hospital. There are, of course, exceptional cases where tampon treatment might be applied.

DR. WM. R. NICHOLSON.—I have seen quite a number of cases of rupture of the uterus under the various headings mentioned by Dr. Hirst, but to my mind the most interesting part of the discussion relates to the rupture of a scar of a preexisting cesarean section. I happen to have had three of these cases, one fatal and two resulting in recovery. The fatal case was taken to one of the large hospitals in town but was refused admission by the interne on duty since this hospital did not admit maternity cases and his examination did not reveal to him that this woman was anything other than a beginning labor. Two cases ruptured, one in the succeeding pregnancy, while the other had had a vaginal delivery between her cesarean and the pregnancy during which I saw her. Both these cases had been operated upon by competent men.

The point to call attention to in each of these cases is that the rupture occurred apparently while they were in the hospital, and without symptoms which were at all diagnostic. When they were seen by me each was having slight pain, not at all characteristic of labor and without pulse or temperature rise. In neither case was the cervix obliterated and in neither case was the membrane ruptured. Operation in both instances disclosed intact membranes, the fetal sac with the placenta being free in the abdominal cavity, while the ruptured uterus was firmly contracted

in the pelvis. Both these cases recovered with a perfectly normal postoperative history. While the microscopic study was not absolutely conclusive, in either instance, I believe that both cases lacerated through the old cesarean scar.

As far as the etiology of rupture is concerned, my personal belief is that to a large degree it depends upon the site of placental attachment. If a woman who has had a cesarean has an implantation of the placenta in her next pregnancy, over the old scar, the synechial activity will digest the scar tissue and will therefore result, in a large proportion of cases, in the type of rupture which I am describing. In other words, that rupture may occur, and probably will occur, before labor begins, and that the pain results simply from peritoneal foreign body irritation.

I do not believe that it makes the slightest difference how the uterus is repaired, as far as the probability of subsequent rupture is concerned. While I do not claim that it is necessary for a woman who has had one cesarean to always be delivered by a cesarean subsequently, I nevertheless feel that it is a very much safer procedure, and I also believe that if it were possible to obtain reliable statistics, that subsequent rupture would be found to occur in cesareanized women very much more frequently than any statistics have so far indicated.

DR. EDWARD A. SCHUMANN.—I can add two cases, one occurring after a condition not previously reported here. The first was a rupture by direct violence in a woman pregnant at almost term. She was carrying a chair downstairs when she fell, the leg of the chair passing through the vagina and into the abdominal cavity. The chair was extracted, the leg having been tightly wedged into the abdomen and the patient was rushed to the hospital where she died within half an hour after admission before any operative measures could be instituted. The second case was in a woman whom I had previously delivered with high forceps and in her second pregnancy she had been in labor several hours, when my associate, Keller, elected to do version. He told me as he attempted to turn the child the legs came down with difficulty. Suddenly the legs came down and there was a rent in the right side extending through the abdominal cavity. The patient was in profound collapse and he decided rather than perform immediate operation he would pack the rent and hope for reaction, with a second hysterectomy. However, the patient did so well that at the end of two weeks no one could possibly have detected the presence of a uterine rupture. The uterus had completely involuted, although the original rupture had extended to the fundus.

DR. GEORGE M. BOYD.—Meddlesome midwifery, also disregard for the time element in labor, is the cause of some of these disasters. We can reduce the number of cesarean sections in the doubtful cases by giving the labor test. Failing in this we can still resort to a low cesarean. The dictum, once a cesarean always a cesarean, if not adhered to, should be kept in mind because of rupture.

DR. JOHN A. McGLINN.—During twenty-five years of practice, I have never had nor have I ever seen, in all these years, a case of ruptured uterus. I have had cases of perforation of the uterus. Several years ago I read a paper before the American Gynecological Society on intraperitoneal cesarean section, and predicted that if the craze for intraperitoneal and low cervical section kept up that we would have many more cases of rupture following cesarean section. I based my contention on the fact that spontaneous rupture usually occurs in that part of the uterus where the incision is made for low cervical section. My contention has not been borne out by statistical returns but I still expect when more cases of low cervical section have been reported that we will find many more cases of rupture. I have had recently three cases of attempted version referred to me where it was necessary to do a craniotomy on the head in two cases and on the third a hysterectomy. These three uteri must be made of cast iron not to have ruptured.

DR. J. C. HIRST.—About a year ago we had a true spontaneous rupture of the uterus in the University Maternity. The baby was lying entirely free with the placenta in the abdominal cavity, having been extruded through the very top of the fundus. After hysterectomy the uterus was found to have undergone considerable hyaline degeneration in and around the ruptured area. The interesting feature about this case was that she had never had a labor pain nor a fall nor any possible cause for the rupture.

A different case followed this in the Philadelphia General Hospital where a multiparous patient after a long labor developed a rupture of the entire left side of the uterus resulting in the retention in the uterus only of a hydrocephalic head. The question of craniotomy arose here but we were sure of the injury and therefore performed a successful hysterectomy. Each of these women made a complete recovery.

DR. ALICE WELD TALLANT.—During the years I was at the Woman's Medical College, the only case I ever saw was from an outside physician, brought to the hospital, and version was done. We never knew when the uterus ruptured. It was an interesting point to know who had done it. Version was done rather early. There was some little bleeding and an assistant began to pack the uterus. I then found a small rupture. The patient had a hysterectomy done and made a good recovery. I mention this case as it might have been caused by packing too vigorously, or I may have ruptured uterus by version.

DR. NORRIS W. VAUX.—Statistics which I have been able to find in this college library seem to prove conclusively that the majority of ruptures, no matter how they occur, are in the lower uterine segment. The lower uterine segment apparently is the expansible portion of the uterus. The upper portion is the contractile portion. If the contractile portion is contracting against the lower expansile part it is rather natural to suppose the stretching area is more likely to split or rupture. The majority occur in the poor obstetrics we see occasionally practiced and I reported these cases in the hope that we would gain from discussion some result at betterment and some further criticism as to the judgment used in the time and method of operative interference. I believe that spontaneous rupture takes place and usually occurs in the uterus where some degeneration of the muscle wall exists, such as the perforation of the chorionic villi or where myomatous or inflammatory change has weakened the wall structure.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Physiology and Pathology of Labor

Ludwig and Lenz: Labor Observed through an Abdominal Window. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1923, lxxxvi, 589.

The authors report most interesting direct observations of the muscular activity of the rabbit's uterus through celluloid windows sewed into the abdominal wall, using a modification of the technic of Katsch and Borchers.

They find that the normal nonpregnant uterus shows an alternation of periods of rest and peristalsis; these periods are of considerable duration. The contractions travel like a peristaltic wave over the whole organ, through the whole length of the uterine horn, or gradually become lost after having travelled part way. In the course of the peristaltic waves, at various places stronger tonic ringlike constrictions appear which may be multiple. Coincident with tubelike peristaltic contractions a shortening of the uterus in its long diameter occurs. In addition to the peristaltic waves, which originate at the uterine horn and travel toward the cervix, there are also occasional antiperistaltic waves which travel in the opposite direction. Although the uterus during its contractions shows more or less motion in its relation to the other abdominal organs, definite pendulum motions such as are seen in the intestine, were not observed. The contracting part of the uterus always appears markedly anemic while the relaxed portion shows normal circulation. The two uterine horns function entirely independent of one another.

Observations on the pregnant uterus showed an almost entire absence of contractions, or only very small ones, scarcely noticeable, which could be observed only on short segments of the uterus, whereby the form of the uterus scarcely changed. Ring contractions never appeared definitely, and also the circulation in the contracting part showed little change from that which was resting. The whole organ had usually a deep blue color, and seemed to be absolutely passive in the abdominal cavity. The individual fetuses could be easily distinguished through the musculature and fetal movements were definitely visible.

In the earlier experiments, spontaneous labor was awaited but in the later ones, labor was induced by an injection of placental and pituitary extracts. Though neither of these are effective alone, it was found that labor could be induced in the rabbit at any period of pregnancy by a combination of the two. The course of labor was practically the same in all cases whether it was spontaneous or artificially induced. The writers describe in detail a typical labor induced three days after the introduction of the celluloid window in an animal two to three weeks pregnant. The uterus shows slight peristaltic and antiperistaltic movements, never affecting its whole length and the ring contractions are also entirely absent. Almost immediately following the injection of 0.5 c.c. of placental extract intravenously, there appear extremely strong peristaltic waves which traverse the whole

length of the organ and recur every three minutes. These begin in the upper portion of the uterus and move down as peristaltic waves, the ring contractions are less definite, the maximal contraction appears rather as a cylinder. There is only an insignificant decrease in length. At the point of maximum contraction, the almost 4 cm. wide uterus decreases to one-half cm. and this area becomes markedly anemic. After about 15 minutes, the peristalsis quiets down somewhat, 1 c.c. of placental extract now given intravenously markedly increases the strength and duration of the peristaltic waves. Extremely marked cylindrical contraction rings appear between the different fetuses to be followed by maximum relaxation. One half c.c. pituitrin given ten minutes later causes a tetanic contraction with cessation of all peristaltic waves, which gradually disappears after 40 minutes and is followed by the reappearance of waves at 3 to 5 minute intervals. The first fetus was born unobserved during the night. Throughout the entire following day, uterine activity was quite feeble, slight peristaltic waves appearing every 15 to 20 minutes. Renewed activity is brought about by the further injection of 1 c.c. of placental extract subcutaneously and 0.5 c.c. pituitrin intravenously. The latter is followed by an intense general contraction of the uterus. The lowest contraction ring between the two lowest fetuses seems almost to cut through the uterus and moves from above downward. The lowest segment is for a moment in an intense tetanic contraction and at this moment with a strong pressure of the abdominal muscles, the second fetus is born. The afterbirth follows a moment later, the uterus expelling it by a cylindroid tonic peristalsis from the lower contraction ring downward with the help of the abdominal muscles. The next lowest fetus is now pushed into the lower uterine segment and the process is repeated.

The other horn does not participate at all in this activity, it shows only a few slightly increased pregnancy contractions. The puerperal uterus shows marked rhythmic activity of the cylindroid-peristaltic type with the formation of multiple contraction grooves, which gradually decrease in activity. MARGARET SCHULZE.

Nürnberg: The Biology of the Isthmus Uteri. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1922, lxxv, 1.

The isthmus uteri is an anatomically and functionally distinct segment of the uterus placed between the fundus and the cervix. It forms the upper third of what is usually considered the cervical canal, and its upper boundary is the anatomical internal os. Its lining mucosa resembles that of the uterine body and its lower boundary is at the point where this meets the typical cervical mucosa. This point can only be determined microscopically. The musculature of the isthmus is of looser texture and there is more connective tissue than in the myometrium, but not so much as in the cervix proper. The elastic tissue content is also midway between that of fundus and cervix.

In pregnancy and labor, the isthmus uteri forms the lower uterine segment. Pathologically the isthmus uteri may form the placental site in cases of placenta previa, and it forms the most frequent site of uterine rupture in cases of extreme dystocia. As a placental site, the isthmus uteri shows a definite functional insufficiency, due largely to the imperfect development of the decidua, particularly the glandular layer, which leads to pathologic adherence of the placenta. Post-partum hemorrhages are most often due to retention of adherent fragments, rather than atony from insufficiency of the musculature.

Researches of the author upon a considerable number of premenstrual and menstruating uteri, showed that in spite of the strong anatomic resemblances between the two structures, the mucosa of the isthmus uteri did not participate in the premenstrual congestion of the endometrium. Menstrual hemorrhage does occur from the isthmus, but instead of the loss of the whole functional layer as in the uterus,

only the surface epithelium with the portion of stroma lying directly beneath it is cast off. This lack of the premenstrual or pregravid changes in the isthmus uteri will explain largely its unsuitability as a nidation site for the ovum.

MARGARET SCHULZE.

Kosakai, Ziro: The Action of Combinations of Uterine Stimulants. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1922, lxxxv, 364.

The author summarizes his conclusions as follows:

(1) Albumin-free and cholin-free placental extract causes uterine contractions. (2) The initial activity of placental extract as compared with other oxytocics is not particularly great. (3) The tonus of the uterus invariably decreases after the decline of the first action of the placental extract. Repetition of the injection increases the activity anew, in fact, the second result is usually greater than the first. (4) A certain time after the administration of placental extract, but particularly after repeated doses, there occur rhythmic equal contractions separated by regular intervals. These characteristic contractions are very similar to the physiologic contractile activity. (5) The latter is best obtained by the administration of a combination of placental and hypophyseal extracts. This combination invariably excites intensive characteristic contractions in the uterus *in situ* in any phase of sexual activity. The immediate as well as the subsequent contractions are much stronger, and the latter occur much more rapidly than after administration of placental extract alone. The puerperal or gravid uterus shows these contractions much sooner than the non-pregnant organ. Typical contractions of the isolated organ occur only in the pregnant uterus; in the nonpregnant uterus they are very small or even quite uncharacteristic. (6) Repeated administrations of combinations of placental and hypophyseal extract increase the excitability of the uterus. The contractions become much stronger and more lasting. (7) An animal which has been given hypophyseal extract reacts to placental extract with much stronger, repeated contractions than one which has been given placental extract alone, or one in which the pituitary extract is given following the placental. The decrease in tonus after the action of the placental extract wears off, is not so great if hypophyseal extract has previously been given. The reactions of the isolated uterine toward hypophyseal extract are very much greater after previous treatment with placental extract than after administration of hypophyseal extract alone or after placental extract following hypophyseal. Typically recurring characteristic contractions occur only in the pregnant or puerperal organ. (8) An isolated uterus previously sensitized by the combined action of placental and hypophyseal extract which has once shown the characteristic contraction may be again rapidly stimulated by placental extract, hypophysis, or secale alone. (9) An injection of adrenalin does not influence the onset of the characteristic contractions in rabbits or guinea pigs, but if contractions are already occurring, it seems to act more favorably. The adrenalin in action, like that of the other extracts mentioned above, is greater following the administration of other uterine stimulants.

MARGARET SCHULZE.

Mennet, J.: The Use, Action and Dangers of Pituitary Medication in Obstetrics. *Schweizerische Medizinische Wochenschrift*, 1923, liii, 549.

The various disasters reported in literature from the use of these preparations can be avoided by their intelligent use in each case. Violent pains last for about forty minutes after the intravenous, and an hour after intramuscular injections. Pituglandol does not cause the same type of severe or rapid reaction as pituitrin. The best opportunity for intramuscular or subcutaneous injections is presented in marginal placenta previa and in primary and secondary weakness of contractions

at the end of the first and during the second stage. Intravenous medication should be used only during the second stage. Other indications for the intramuscular and subcutaneous injections are: marginal placenta previa with ruptured membranes, central placenta previa after combined version, hydramnios after the rupture of the membranes, prolapse of the cord or small parts after they have been replaced, in contracted pelvis where the head had become fixed with the use of the Walcher position. Contraindications are: extreme contractions of the pelvis, threatened rupture of the uterus, unfavorable positions, asphyxia of the child, poor dilatation of the cervix in first stage, absence of pains, general diseases of the patient such as arteriosclerosis and kidney diseases with abnormal blood pressure. The preparation is used in the third stage to hasten the delivery of the placenta. It is advised that midwives be not allowed to obtain or use the preparations.

A. C. WILLIAMSON.

Jacoby, P.: The Effect of Small Doses of Pituitrin. *Acta Gynecologica Scandinavica*, 1924, iii, 26.

It seems well established that the usual 0.5 cm. dose of pituitrin can well be replaced by one of 0.2 cm., since the effect is practically the same. Where the effect of the smaller dose is only fair or nil, a better result is not obtained with a larger dose. Very small doses of pituitrin have the same good effect in the first and second stages of labor. The injections can be repeated frequently. The position of the fetus and parity play no part in the effect of pituitrin, but the effect is less marked in older women. The results are good in primary and secondary inertia but are not very satisfactory in prolonged labors and in cases where there is elevation of temperature. Minimal doses of pituitrin in the author's experience were not dangerous to either mother or child. Because of this the author advocates the use of the drug early in labor and with frequent repetition.

J. P. GREENHILL.

Nystroem, B.: Compression of the Aorta in the Practice of Obstetrics. *Finska Läkaresällskapet*, 1923, lxx, 679.

The writer describes all the methods of compression of aorta or uterine arteries for postpartum hemorrhages so far devised. In detail he gives results obtained by him in 15 cases with the Selzt aorta clamp, which he slightly modified by placing, both on the branch lying on the back of the patient and that compressing anteriorly the aorta, an elastic cushion. (Illustrations are given in the text.) The clamp was applied either before or after expulsion of the placenta.

Experience so far had with the instrument permits the deduction that it is of great value, especially in home work when experienced assistance in handling a severe postpartum hemorrhage is not readily available, and even primitive asepsis hardly can be obtained.

Though applied for times varying between 3 and 16 minutes the Selzt clamp in no instance caused the patient any noteworthy annoyance. Nevertheless the complete cutting off of all blood supply to the lower part of the body implies enough potential danger to make this method of treatment desirable only in cases where other simpler methods are not available or have failed. (Author's abstract.)

Zimmerman: The Control of Postpartum Hemorrhage by Clamping the Parametrium by Henkel's Method. *Archiv für Gynäkologie*, 1923, cxx, 160.

In the last 1600 deliveries at the Jena clinic, clamping of the parametrium to control postpartum hemorrhage was done in 17 cases, 6 being for placenta previa, 6 for hemorrhage due to uterine inertia and atony, 1 for carcinoma of the cervix,

2 for severe postabortal bleeding and 2 for atony following cesarean section. The clamps were left in place from 2-24 hours. The method is rapid, aseptic and certain, and is indicated whenever uterine bleeding cannot be controlled by drugs or external manipulation.

RALPH A. REIS.

Hochenbichler, A.: The Entrance of the Head into the Pelvis in Primiparas and Multiparas. *Monatsschrift für Geburtshilfe und Gynäkologie*, 1922, lix, 250.

Under physiologic conditions, where there is no disproportion between the head and the pelvis, there is no essential resistance to the entry of the head into the pelvis. Some factors favor entry while others tend to hinder it. In the former class is the *vis a tergo* due to the contractions of the uterus and the abdominal wall. In the latter class are the lack of false pains during the last period of pregnancy and a diminished tonus of the uterine muscle due to previous labors and a relaxed abdominal wall. In this class also, and of more importance, is a high position of the uterus due to an increase in the amount of liquor amnii or other conditions. The overstretched lower uterine segment cannot accommodate itself to the narrow pelvic canal and therefore remains above the pelvic inlet.

Through the expulsion of a certain amount of liquor amnii, the lower uterine segment always to some extent sinks deeply into the small pelvis. The head in these cases finds no noteworthy resistance and the extent of its descent is measured by the amount of *vis a tergo*. This is more in primiparas and explains the entry of the head into the pelvis toward the end of pregnancy in these patients. In polyhydramnios the head remains high in primiparas as well as in multiparas and sinks only where a large amount of liquor is expelled and the stretching of the soft parts is sufficiently advanced.

J. P. GREENHILL.

Harper, Carl S.: Management of Occipito-Posterior Positions. *Wisconsin Medical Journal*, 1924, xxiii, 23.

Careful and early diagnosis of all possible causes of delayed labor should be made, always keeping in mind, especially in a primipara, that posterior positions of the occiput are very common. Progress of labor should be closely followed with frequent "check ups" by the physician, and not left to untrained observers. Most "obstetrical wrecks" are occasioned by faulty, or entire lack of observation. In selected cases, manual rotation of the occiput above the pelvic brim is the method in occipito-posterior positions requiring interference.

F. J. SOUBA.

Weinzierl: High Median Occiput Presentations. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1923, lxxxvi, 221.

The author presents a study of 18 cases of high median occiput presentations in a series of 8800 labors occurring from 1912 to 1922 in the Prag Clinic. The cases were equally divided between the pos. occip. pub. and the pos. occip. sacr. The former position occurred twice as frequently in multiparae as in primiparae, the latter showed seven primiparae to two multiparae. Of the 18 cases only three, two of these pos. occip. sacr. were delivered spontaneously, all the others requiring operative measures. The author, therefore, concludes that this position is not merely a rare, but also a very serious complication of labor. There is probably no single etiology, but the condition is the result of a rare summation of various factors. Although there is a possibility of spontaneous labor, it is decidedly against the rule. For this reason, a very conservative attitude should not be maintained since the labors are always protracted, and the prognosis for both mother and child, but particularly for the mother, increases progressively in severity with the length of labor. Among the operative measures for delivery, the Kielland forceps used as a rotator should be particularly emphasized.

MARGARET SCHULZE.

Haupt: The Cause of High Median Sagittal Presentation with Especial Consideration of Disproportion between Maternal Pelvis and Fetal Head. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1923, lxxxvi, 459.

The occurrence of high median sagittal presentations is both relatively and absolutely more frequent in cases of disproportion than where there are normal relationships, whether this disproportion is due to contracted pelves of various types, or due to a large head, or to both. Aside from transversely contracted pelves, in which the etiology is clear, the forms of the pelvis whether generally contracted or flat, appear to play a rôle only insofar as the sacral position is more common in the former, the pubic in the latter. The previous or subsequent labors of the same woman are not necessarily all by the same mechanism. The back is not always primarily—nor even later—forward. In many, probably in most cases, the skull possibly because of peculiarities in its resistance is the direct cause of the presentation.

MARGARET SCHULZE.

Rowland, J. A.: A Case of Unusual Malpresentation. *The Indian Medical Gazette*, 1923, lviii, 24.

The writer reports a case of a multipara, in labor at term more than twenty-four hours. Vaginal examination disclosed the head, a foot and a hand firmly impacted in the vagina, the head between the hand and foot. Patient was anesthetized but parts could not be replaced so head was perforated and arm removed at shoulder joint but still version could not be done. Head was severed from thorax by cutting with scissors. Head was then pushed back, uterus explored and child extracted. There was difficulty in extracting the head. After delivery a sessile submucous fibroid, the size of a large orange, was found in the upper segment of the uterus. The tumor was incompletely split in halves. Patient had had two normal deliveries previous to this confinement. Patient died about twenty-four hours later.

F. J. SOUBA.

Stiglbauer, R.: The Treatment of Brow Presentations. *Monatsschrift für Geburtshilfe und Gynäkologie*, 1924, lxvi, 205.

Among 72,000 labors which occurred in the Second Woman's Clinic in Vienna during the last 22 years, there were 65 cases of brow presentation, i. e., one brow presentation to 1108 births. In only a few cases was the origin of this deflection attitude found but most of the babies were larger than normal. In almost one-half the cases there was some degree of pelvic contraction and 37 of the patients were multiparas. Of the 65 babies, 25 or 38.5 per cent were born spontaneously and 19 of these were born alive. Of the 40 children delivered by operative procedures 15 died. Among the operative procedures were version, cesarean section, forceps, hebostotomy and craniotomy. The Kielland forceps proved especially valuable and the author believes these forceps will save many babies and make cesarean section in some of these cases unnecessary.

J. P. GREENHILL.

Pfeiffer: The Management of Breech Presentation. *New York Medical Journal*, 1921, cxiii, 178.

As the inherent fetal mortality is far higher in breech than in head presentations, an attempt should always be made to correct this position. External version is more often more successful than is commonly supposed and may frequently be accomplished before labor or early in labor if the membranes are unruptured. The membranes often rupture at the onset of labor because the irregular breech does not fill the lower uterine segment as well as the globular head. It is therefore well to keep the patient in bed to preserve the membranes intact and to prevent

prolapsed cord if ruptured. Early interference is not only meddlesome but dangerous, as an incompletely dilated os is the most frequent cause of difficulty in extracting the head. Labor should be allowed to progress until the umbilicus is delivered unless positive indications for interference develop. The pelvic floor should be prepared by manual dilatation or a central episiotomy. Proper assistance is of great importance, so that head and arms may be kept well flexed and delivery accomplished by expression rather than traction. Cesarean section is never justified in breech presentation *per se* but only when other indications coexist.

MARGARET SCHULZE.

Abernethy: The Direct Shoulder Delivery of Müller. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1924, lxxxvii, 36.

After a critical review of the literature and an analysis of his own statistics, the author concludes that the direct delivery of the shoulders by traction on the body in breech extractions, as described by Müller, gives better results than indirect delivery of the shoulders with release of the arms. He, therefore, recommends even in contracted pelves of the second degree that the child be delivered by direct traction so long as progress continues.

MARGARET SCHULZE.

Rombach: Unsuspected Pregnancy. *Nederlandsch Tijdschrift voor Geneeskunde*, 1923, i, 276.

Since the question, whether a woman may be pregnant and even go into labor without being cognizant of her condition, has a medicolegal aspect, the author reports two cases which have some bearing on this question. Both were married primiparae, the one not expecting to be pregnant and the other, after four years of sterility, having given up all hopes of bearing children. While both experienced the usual amenorrhea, they paid no particular attention to it. One of the women wore her usual corset during the entire pregnancy and neither one complained very much of pain, even during the second stage.

R. E. WOBUS.

Boursier and Gautret: Acute Polyhydramnios. Abdominal Puncture with Continuation of Pregnancy. *Bulletin de la Société d'Obstétrique et de Gynécologie de Paris*, 1923, xii, 389.

A patient whose previous pregnancies had been normal, showed in the eighth month of the present pregnancy a moderate degree of polyhydramnios. This anomaly however, rapidly increased and the patient experienced severe pains in the epigastrium and in the right flank and hypochondrium. There were no respiratory or circulatory disturbances but despite this it was decided to intervene. A puncture was made just below and to the right of the umbilicus and about 2 liters of clear amniotic fluid were slowly withdrawn, after which the uterus was soft and the fetal heart tones could be heard. The patient was given morphine and no uterine contractions were felt. After seven or eight days the fluid reaccumulated in the uterus and the pains recurred. The patient went into labor spontaneously 17 days after the abdominal puncture. Great difficulty was encountered in delivering the child, which weighed 4050 gm. The maternal blood Wassermann was negative.

J. P. GREENHILL.

Luker, S. G.: The Dangers and Treatment of Prolonged Pregnancy. *The Clinical Journal (London)*, 1922, li, 618.

A common cause of difficulty at delivery is the disproportion between fetal head and maternal pelvis due to allowing the pregnancy to be prolonged. The usual method of induction is an ounce of castor oil early in the morning of the expected

labor, a light breakfast is allowed afterward. Two hours later the patient is put in a sitz bath up to the waist, temperature between 105 and 110. Large soap and hot water enema given. Quinine sulphate grains x is now given and two hours later grains v, to be followed in two hours by a second dose of grains v. A tight binder is applied and the patient encouraged to move about. Labor usually comes on within a day. If castor oil fails, labor should be induced with bougies. No case should be allowed to go over seven days past the estimated date unless there exists a doubt as to the last period. All pregnancies are due 280 days from the first day of their last period.

A. C. WILLIAMSON.

Vogt, E.: Characteristics of the Present Day Conception and Management of Retroflexion of the Pregnant Uterus. *Klinische Wochenschrift*, 1923, ii, 451.

The author believes that as a rule the retroflexion is primary and the pregnancy secondary. In the vast majority of cases, the retroflexion is corrected spontaneously as the pregnancy advances. In the Women's Clinic of Tübingen, in operating upon a large number of prolapse cases, usually associated with retroflexion, they have contented themselves with plastic repair, allowing the uterus to remain posterior. Subsequent pregnancies in these cases have gone to term without disturbance.

Even in cases of spontaneous correction, abortion may occur, on account of the damage to the endometrium through swelling and inflammatory changes before the correction takes place. This "nature healing" may be prevented by adhesions, by an infantile pouch of Douglas, by an abnormally prominent promontory, or even by fixation of the portio over the symphysis. In the author's opinion, however, the nonoccurrence of spontaneous correction is most probably due to atony and maldevelopment of the round ligaments and of the uterine musculature, and possibly also to an overdevelopment of connective tissue in the isthmus uteri, whereby its normal function as a sort of lever may be disturbed.

The symptomatology of this condition is characteristic, and depends almost entirely on the urinary bladder. In the third or fourth month of pregnancy dysuria develops and increases steadily; paradoxical ischuria is the rule; there is also pressure on the rectum, tenesmus, obstipation, and at times symptoms of ileus. The bladder is distended, occasionally reaching to the umbilicus or higher. Differential diagnosis from other pathologic pelvic conditions is not as a rule difficult, especially if one remembers the bladder symptoms.

The chief complication is urinary infection, with at times gangrene of the bladder mucosa; there may also be ileus, intestinal gangrene, infection of the uterus and its contents, peritonitis, rupture of the uterus, or even rupture of the posterior vaginal wall. In one case, the fundus protruded through the distended anus.

The preferred treatment is manual reposition under anesthesia (spinal or scopolamine-morphine), after emptying the bladder and the rectum. In gangrenous cystitis, if the catheter cannot be employed successfully in spite of irrigations, etc., the bladder must be opened widely by a vesicovaginal incision. If there is no gangrene, but catheterization fails, suprapubic puncture is to be made.

At times, colpeuryesis may be employed as a preliminary to manual replacement. Occasionally, the distension of the vagina and the rectum by air (through the simple introduction of specula), will greatly facilitate the subsequent replacement. Posture, such as the knee-chest position, may help considerably.

Reposition is not to be attempted in the presence of gangrene of the bladder or of a markedly contracted pelvis. Here therapeutic abortion is strongly indicated, as well as in cases of inevitable abortion, infection, or poor general health. This procedure is carried out in the usual manner, or posterior vaginal section may be employed. Puncture of the uterus through the posterior vaginal wall,

and even symphysiotomy, have been recommended, but are condemned by the author.

If efforts at manual reposition fail, and there are no contra-indications, replacement by laparotomy is indicated, though Vogt has not so far had occasion to resort to it.

As a prophylactic measure, a retroverted uterus which is discovered in early pregnancy should be replaced by gentle bimanual manipulation and a pessary should be worn thereafter for five or six weeks. Furthermore, women who have been under treatment for retroflexion should be instructed to return for examination should they become pregnant, in order to ascertain whether the uterus is in normal position.

E. L. KING.

Klots: A Case of Incarceration of the Pregnant Retroflexed Uterus with Rupture of the Bladder. *Nederlandsch Tijdschrift voor Geneeskunde*, 1924, i, 1942.

A Javanese woman aged thirty-five who began to menstruate and was married at 16, was pregnant for the third time. She had previously been delivered spontaneously of healthy children. For 5 days she complained of pain in the lower abdomen and inability to void. The bowels had not moved during this time, but flatus were freely expelled. Rhythmic contractions of a cystic tumor in the lower abdomen were interpreted as uterine contractions. On later examination, these contractions as well as the tumor had disappeared, without any change in the pain. The temperature remained normal, but pulse and breathing became accelerated. Catheterization yielded only 20 c.c. of thick bloody urine. Vaginal examination revealed the incarcerated pregnant uterus in the hollow of the sacrum.

The diagnosis of rupture of the bladder having been made, the abdomen was opened. Several liters of urine were free in the abdomen and the bladder showed a necrotic area with a bleeding point from which urine was issuing freely. This was sewed up and the necrotic area buried with Lembert sutures. After this, the uterus was brought forward. It was found that the coccyx had been bent at right angles, causing a groove in the posterior uterine wall. The coccyx, however, was easily bent downward, after which reposition was accomplished. Patient aborted next day, passing a macerated 4 month fetus. Recovery was surprisingly prompt and uneventful.

R. E. WOBUS.

Küstner: The Bacteriology of the Separating Umbilical Cord under Various Methods of Treatment. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1922, lxxxiv, 771.

The author reports bacteriologic observations upon two series of newborn children in which the umbilical cord was treated in radically different manner. In the first series of 120 children, the navel was covered with dry sterile dressings changed every 48 hours, and the child was not bathed until after the cord had separated and the umbilicus healed, usually in eight to ten days. In the other series of 80 cases, the child was bathed daily and the dressing renewed after the bath. In this series, the cord usually separated earlier, on the fifth to seventh day, but the small wound left ordinarily did not heal for several days more. Culture material obtained from the depths of the navel was placed on Loeffler's serum and ascites agar.

In the unbathed children, the ordinary skin organisms were most frequently found. The coli group, the staphylococcus albus, diphtheroids, and harmless parasites comprised 72.4 per cent of the cases. The remaining 27.6 per cent were organisms which probably always possess sufficient virulence to form a menace to the child: staphylococcus aureus, the hemolytic staphylococcus albus and the streptococcus. Sixty of the 120 children showed some type of pathogenic organism on at

least one examination, but usually its presence was only transient. In a few cases showing definite evidence of infection, the pathogenic organisms were constantly present on repeated examination in spite of careful treatment. Since therapy apparently accomplishes so little, the necessity for careful asepsis is even more apparent. The type of delivery, even including cesarean section, had no apparent influence on the bacterial flora, nor did the bath for resuscitation in the asphyxiated cases.

The children bathed daily, however, showed markedly different results. Here only 49.5 per cent showed nonpathogenic, while 50.5 per cent showed pathogenic organisms on at least one occasion.

The author concludes from these observations that it is best not to give infants a complete bath until the umbilicus has healed. MARGARET SCHULZE.

Gilfrich: Rupture of the Umbilical Cord Vessels during Labor. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1923, lxxxvi, 633.

The author discusses the literature of this condition and cites several cases of his own. He believes that it occurs far more frequently than is reported. Rupture of the entire cord is fairly common, rupture of isolated vessels far less frequent. The most common etiology is the occurrence of vasa previa in the velamentous insertion of the cord. Vasa aberrantia if situated near the os may rupture. Anomalies of the vessel walls, as varices, may be a factor. A too short cord, or tension due to looping of the cord about the neck or an extremity, may be predisposing factors, and operative manipulations may be a direct cause of injury.

The author collects 52 cases of rupture of vessels in velamentous insertion. The accident is rather rare. The prognosis for the child is extremely bad since 24 of the 52 children died. Seven of the cases occurred in twin pregnancies; in only two of these did the children live. In a few cases, the diagnosis of vasa previa was made by feeling a cord-like pulsating thickening in the membranes stretching across the internal os. Usually hemorrhage with rupture of the membranes gives the first hint of the condition. Two cases of vasa aberrantia gave similar symptoms.

Varices of the vein walls may lead to the formation of hematomas in Wharton's jelly, external bleeding after the formation of a hematoma, or free external bleeding without the formation of a hematoma. The hematomata often form considerable tumors, as large as 5 cm. in diameter. The condition is of considerable danger to the child.

Rupture of a vessel by external trauma as on freeing a tight loop of cord or by obstetrical instruments is of much less danger, since the child is already or soon delivered and the lesion may be competently dealt with. MARGARET SCHULZE.

Häggström, P.: Prolapse of the Umbilical Cord. *Acta Gynecologica Scandinavica*, 1924, ii, 517.

From 1900 to 1923 there were 71 cases of prolapse of the cord among 13,907 cases of childbirth, an incidence of 0.51 per cent. This agrees fairly well with Nordlund's estimate of 0.65 per cent, which was the average of the reports of 10 different authors. Among the 71 cases reported by the author there were five times as many multiparas as primiparas and the accident occurred proportionately three to four times more commonly after forty years of age than before. The pelvis was contracted in 24 per cent of the patients. There were 10 twins and in 7 of these the cord which prolapsed was that of the second child. Polyhydramnios and placenta previa each occurred four times and prolapse of an arm 9 times in the series. Many of the babies were either very large or very small.

In only 66 per cent of the cases was there a head presentation. The average

length of the cord was well over 70 cm. There was no maternal death but a fetal mortality of 36.6 per cent. The children of primiparas had a much higher mortality. The prognosis for twins, however, is very good since only one baby died out of ten twins. In 12 cases where delivery was spontaneous 8 babies died. In only 4 cases was the cord successfully replaced but one of these babies died. Seven of nine children delivered by forceps lived. After version and extraction 15 out of 20 children lived, while breech extraction yielded 13 live babies out of 14. On one patient a vaginal and on another an abdominal cesarean section were performed, both babies being born alive.

J. P. GREENHILL.

Bermann: Prolapse of the Cord. *Gynécologie et Obstétrique*, 1920, ii, 347.

The author gives the histories of seven cases of prolapsed cord in which a live child was extracted after the cessation of funicular pulsation.

His study of these cases and others in literature leads him to draw the following conclusions. (1) Absence of pulsation in a prolapsed cord, even in the absence of fetal heart sounds, is not proof that the child is dead. (2) In the above contingencies, if dilatation is sufficient, one should introduce the hand and observe by palpation of the precordial region whether or not the fetal heart is beating. (3) Even if no heart beat is evident, if it is possible, one should extract the child and not consider embryotomy until one hour has elapsed after all signs of life have been absent. (4) The chance of life depends upon the degree and length of time of compression, rapidity of extraction, and proper employment of all means of resuscitation.

R. T. LAVAKE.

Zangemeister: Manual Replacement of Prolapsed Cord. *Muenchener Medizinische Wochenschrift*, 1920, lxxvii, 1375.

The author is forced by contemporary criticism into a defense exposition of his stand regarding the relative merits of manual replacement of the prolapsed umbilical cord. He objects to the common practice of employing manual replacement only when version and breech extraction are absolutely contraindicated.

He holds the indications for manual replacement to be: (1) Where rapid spontaneous delivery is assured after replacement of cord; (2) Where version and breech extraction is especially difficult (nulliparae), or fraught with danger.

Manual replacement is contraindicated: (1) With dead fetus; (2) With marked injury to fetus; (3) In case of cord appearing outside of vulva; (4) When the intensity of the pains, or relative disproportion between fetal head and pelvis, or the position indicate delayed delivery.

Face presentation or prolapse of an arm are not contraindications to manual replacement of cord. With incomplete dilatation (permitting the hand but not the fetus to pass) manual replacement is especially indicated. When the dilatation does not permit of manual replacement, when the birth canal is not contaminated, and when the child is at term or clearly viable, abdominal or vaginal caesarean section must be considered.

S. B. SOLHAUG.

Pettersson, A. S.: Complete Circular Detachment of the Portio Vaginalis during Labor. *Monatsschrift für Geburtshilfe und Gynäkologie*, 1923, lxxiii, 315.

The author reports the case of a 38-year-old primipara who was delivered with forceps after a labor which lasted four days. Following delivery there was no undue bleeding but the portio vaginalis of the cervix was found on the baby's head. In 12 similar cases collected from the literature 75 per cent were primiparas and most were old primiparas. In all the cases the head presented and the pains were very strong. In only 4 of the 12 cases did labor end spontaneously

and in no case was there an unusual amount of bleeding. In most of the cases the external os had been unyielding despite strong uterine contractions. Wallich believes this condition is secondary to a serobloody infiltration which is due to a disturbance in the circulation from mechanical obstruction. Couvelaire believes the rigidity is due to an acute inflammation which also explains the serobloody infiltration emphasized by Wallich. The inflammation brings about a deficiency in elastic fibers.

While in some cases the instrument detached the cervical cuff, in others the latter was expelled spontaneously. All but three of the 12 cases recovered. One patient died of carcinoma of the portio, one of septic arthritis and the third of peritonitis. The prognosis for the babies is bad as only two were born alive. Of 6 patients examined some time after delivery 5 had an imitation portio with an opening in the middle.

J. P. GREENHILL.

Fueth, H.: An Unique Injury of the Vaginal Portion of the Cervix during Delivery (Spontaneous Ring-Shaped Separation of a Large Flap). *Archiv für Gynäkologie*, 1923, cxix, 119.

The patient was a primipara with a slightly contracted pelvis, premature rupture of the membranes, long cervix, short vagina and strong labor pains. During labor the cervix felt spongy and before the head was delivered, a large ring-shaped portion of the cervix was extruded. The cervix now felt absolutely normal as though nothing had occurred. The author discusses 3 other cases found in the literature and the etiology of this condition, as advanced by Schauta. The latter believes that the eccentric location of the os in primiparae during the first stage of labor and the pressure of the descending head causes the necrosis. There is practically no danger of hemorrhage, the only danger being infection or necrosis of the stump. The treatment consists in the removal of the detached portion.

RALPH A. REIS.

Benthin: The Etiology of Suppuration of the Symphysis. *Monatsschrift für Geburtshilfe und Gynäkologie*, 1922, lviii, 141.

The author reports the case of a quintipara who had had four spontaneous labors and whose fifth labor terminated spontaneously after the use of pituitrin. The baby, unlike the others, was small. Twenty-four hours later the patient complained of severe pain in the abdomen which radiated down the legs. She experienced a sensation that something had burst in the abdomen. She fainted and on awakening found she had incontinence of urine. The latter continued during the next day, as did the pain, which had localized in the pelvic bones. On the fourth day control of the urine reestablished. On the tenth day there was an elevation of temperature and a swelling appeared over the symphysis. The patient was not brought to the clinic until one month postpartum. The tumor which seemed to arise from under the pubis, at this time extended up to within two fingers' breadth of the umbilicus. The symphysis was exquisitely tender and internal examination revealed normal genitalia. Examination of the urine was negative. Puncture of the swelling revealed pus and blood, and bacteriologically nonhemolytic streptococci were found. The x-ray showed the pubic bones widely separated. An incision was made and a large amount of pus liberated. Convalescence was rapid but the gait was a waddling one and the separation of the symphysis while less than formerly was still present. Four weeks later the symphysis had united, but pressure still elicited pain and the gait was uncertain.

There are two possible explanations for the suppuration of the symphysis in this case, first, that there was a rupture of the symphysis after which a hema-

toma formed and this was secondarily infected. Secondly, there was a hematoma which became infected and produced a separation of the symphysis. The author believes the origin to be a spontaneous rupture of the symphysis occurring post-partum. He bases his belief on the bladder disturbances, the patient's sensation of rupture in the puerperium, pain in the pelvic bones on motion and the fact that fever did not occur until late.

J. P. GREENHILL.

Koerting: The Question of Air and Gas Embolism during Labor. *Zentralblatt für Gynäkologie*, 1923, xlvii, 1657.

The writer discusses the reported cases of air embolism and arrives at the conclusion that in practically every case the condition really may be attributed to a "gas bacillus" infection. He reviews extensively the literature of this infection.

LITTLE.

Whitman: Obstetrical Paralysis of the Peroneal Nerve. *Surgery, Gynecology and Obstetrics*, 1922, xxxiv, 32.

Paralysis of the peroneal nerve from pressure on the main trunk of the sciatic nerve, in its intrapelvic portion, is a comparatively rare condition. It occurs during prolonged labor, either from direct pressure from a large head in a small pelvis, or from trauma by application of forceps. It may have occurred in a larger number of cases than have been reported. In cases of paralysis occurring below the knee after prolonged or difficult labors, Whitman advises an immediate orthopedic and neurologic examination in order to arrive at a definite diagnosis. Apparatus should be applied immediately to prevent deformity and to enable the patient to get around with the maximum facility. The prognosis as to ultimate recovery should be exceedingly guarded.

R. E. WOBUS.

INDEX

A

- Abernethy, The direct shoulder delivery of Müller, (Abst.), 814
- Adams, T. W., Morphine and magnesium sulphate as an obstetrical analgesic, 266
- Adenocarcinoma of the corpus uteri, myosarcoma complicating, Healy, W. P., 235
- Amastia, unilateral, a case of, Lourin, H. W., 364
- American Gynecological Society, Transactions of Forty-ninth Annual Meeting, 502, 649, 779
- Amnion, recent observations of certain pathological conditions of the, Paddock, R., 546
- Analgesic, obstetrical, morphine and magnesium sulphate as an, Adams, T. W., 266
- Anesthesia, ethylene and oxygen, for gynecological and obstetrical work, Heaney, N. S., 416, 509
- of women, so-called sexual, Moll, A., (Abst.), 675
- sacral-trans-acral, gynecologic plastic surgery under, Magid, M. O., and Klein, W., 79
- Anomaly, congenital, a rare, Peck, Harold A., 761
- Atresia, acquired, of the vagina and cervix, Pemberton, F. A., 605, 660

B

- Backache in women, the causes of, Haendly, P., (Abst.), 674
- Baer, Breast infections, (Abst.), 381
- Bagg, H. J., etiology of certain congenital structural defects, 131, 229
- Bailey, Harold, The serum treatment of puerperal sepsis, 7
- Bedo, F., The care of the breast in nursing mothers, (Abst.), 380
- Belding, D. L., and Hunter, I. L., The Wassermann test, 22
- Benthin, The etiology of suppuration of the symphysis, (Abst.), 819
- Benzel, Repeated tubal pregnancy in the same patient, (Abst.), 247
- Bermann, Prolapse of the cord, (Abst.), 818
- Binger, The psychical etiology and treatment of leucorrhea, (Abst.), 676
- Bissell, Dougal, Surgical treatment of renal papillomata and ureteral implants in the female, 796

- Bladder, Exstrophy of the, an unusual example of, with marked separation of the pubic bones, Sage, E. C., 497
- rupture of, a case of incarceration of pregnant retroflexed uterus with, Klotz, (Abst.), 815
- Books received, 130, 255, 371, 534, 681
- Bourne, A case of eclampsia illustrating the use of veratrine, (Abst.), 533
- Bousier and Gautret, Acute polyhydramnios. Abdominal puncture with continuation of pregnancy, (Abst.), 814
- Brakeman, Changes of the female genitalia in lymphatic leukemia, (Abst.), 678
- Breast cancer, lines of advance in the surgery of, Handley, W. S., (Abst.), 382
- with a study of the results obtained in two hundred and eighteen cases, Sistrunk, (Abst.), 382
- infections, Baer, (Abst.), 381
- in nursing mothers, the care of the, Bedo, F., (Abst.), 380
- menstrual changes in the, Rosenberg, (Abst.), 379
- on buttock, supernumerary, Perkins, (Abst.), 379
- treatment of puerperal conditions of, with light, Temesvary, (Abst.), 381

- Brooklyn Gynecological Society, Transactions of, 660
- Brown, LeRoy, Menstrual disturbance and pain in tubal pregnancy, (Abst.), 244
- Brunam, C. F., Report of some observations of the effects of radium therapy in cases of large uterine fibroids, 411, 502
- Burgess, H. C., A clinical consideration of the contracted pelvis, 739, 787
- Buzzard, E. F., (with Donald, A.), The neurasthenic element in midwifery and gynecology, (Abst.), 675

C

- Carcinoma, early, of cervix, L'Esperance, Elise S., 461
- of the cervix, end results of 201 cases of, Taylor, H. C., and Peightal, T. C., 288
- solid, of the ovaries, reaching to the navel, in girl of nineteen, report of a case of, Dickinson, R. L., 118

- Card, T. A., (with Van Zwalenburg, C., and Jones, W. A.), Double uterus, 634
- Cary, W. H., Two way treatment catheter, 495
- Cashman, B. Z., The cautery treatment of chronic cervicitis with histologic studies, 628
- Casler, DeWitt B., Nephralgia with high blood pressure, 569
- Casualties among women, war and after war, Winter, (Abst.), 671
- Catheter, two way treatment, Cary, W. H., 495
- Cervicitis, chronic, cautery treatment of, Cashman, B. Z., 628
- Cervix, biology of the, a contribution to the, Dretl, (Abst.), 681
- carcinoma of the, end results of 201 cases of, Taylor, Howard C., and Peightal, T. C., 288
- early carcinoma of the, L'Esperance, Elise S., 461
- unique injury of the vaginal portion of the, during delivery, Fueth, H., (Abst.), 819
- uteri, inflammatory disease of the, McGrath, J. F., 367
- Cesarean section, contractions of the pelvic outlet necessitating delivery by, Stone, E. L., 625, 658
- new method of insuring sterility following, Irving, F. C., 335
- Chalfant, Ovarian pregnancy, with report of case, (Abst.), 249
- Chifoliau, Discoloration of the umbilicus in intraperitoneal hemorrhage of pelvic origin, (Abst.), 251
- Childbearing, mental diseases associated with, Gregory, M. S., 420, 516
- Childbirth, painless, by synergistic methods (second paper), Gwathmey, J. T., McKenzie, R. A., and Hudson, F. J., 154
- painless by synergistic methods, Gwathmey, James T., 238
- relation of venereal diseases to, Schumann, Edward A., 257, 366
- Chondrodystrophic dwarf, embryotomy and hysterectomy in, Freed, F. C., 514
- Chorioangiofibroma (chorioangioma), Siddall, R. S., 430, 554
- Clark, J. D., Report of two cases of diaphragmatic hernia, 216
- Cleland, F. A., A method of treatment of severe types of dysmenorrhea, with a report of results in 230 cases, 337
- Collective Reviews:
- New books, Frank, R. T., 371
- Pelvic varicosities, Polak, J. O., and Phelan, G. W., 664
- Progress in the relief of sterility, Curtis, A. H., 123
- Colostrum, the function of the, Lewis and Wells, (Abst.), 379
- Congenital anomaly, a rare, Peck, Harold A., 761
- structural defects, etiology of certain, Bagg, H. J., 131, 229
- Contraception, a medical review of the situation, Dickinson, R. L., 583, 654
- Contraceptive pessary, intrauterine, inefficient and dangerous, Siddall, R. S., 76
- Cord, prolapse of the, Bermann, (Abst.), 818
- prolapsed, manual replacement of, Zangemeister, (Abst.), 818
- umbilical, bacteriology of separating, under various methods of treatment, Küstner, (Abst.), 816
- prolapse of the, Häggstrom, P., (Abst.), 817
- rupture of the, during labor, Gilfrich, (Abst.), 817
- Corpus luteum, bleeding from, simulating an attack of appendicitis, Eiek, (Abst.), 254
- ruptured, intraabdominal hemorrhage from, Moore, (Abst.), 251
- Costa, N. P., One hundred cases of eclampsia treated by the method of Stroganoff, (Abst.), 531
- Cowles, H. C., Occiput posterior, 616, 656
- Culbertson, The relationship of women's diseases to the chronic patient, (Abst.), 674
- Curettage of non-pregnant uterus, septic thrombophlebitis of right ovarian vein following, Vineberg, H. N., 225
- Curtis, A. H., Progress in the relief of sterility, (Collective Review), 123

D

- Dales, Rectal examination in gynecology, (Abst.), 681
- Daniel, Interstitial pregnancy, (Abst.), 248
- Dannreuther, W. T., The incidence and significance of urogenital symptoms in gynecologic patients, 103
- DeAragon, Filarian elephantiasis of the vulva, (Abst.), 682
- Death in married and unmarried women in the middle period of life, Saunders, (Abst.), 673
- Delivery, injury of the vaginal portion of the cervix during, Fueth, H., (Abst.), 819
- des Lignaris, A case of schistosomiasis of the female pelvic genitalia with subsequent tubal pregnancy and abortion, (Abst.), 250
- Dickinson, R. L., Contraception, a medical review of the situation, 583, 654

Dickinson, R. L.—Cont'd

Report of a case of solid carcinoma of the ovaries reaching to the navel, in girl of nineteen, 118

Donald, A., and Buzzard, E. F., The neurasthenic element in midwifery and gynecology, (Abst.), 675

Dorman and Mossman, Puerperal mastitis, (Abst.), 380

Dossena, G., Conservatism in surgical treatment of tubal pregnancy, (Abst.), 243

Dreftl, A contribution to the biology of the cervix, (Abst.), 681

Dysmenorrhea, a method of treatment of severe types of, with a report of results in 230 cases, Cleland, F. A., 337

E

Eclampsia and hydatid mole, Frey, F., (Abst.), 526

and pregnancy toxemia as a specific disease of human reproduction and culture, Sellheim, H., (Abst.), 524

and the weather, Hoenhorst, (Abst.), 526

capillary circulation in, Hinselmann, Nettkoven and Silberbach, (Abst.), 528

case of, illustrating the use of veratrum, Bourne, (Abst.), 533

commentary on the report presented to the British Congress of Obstetrics and Gynecology, June 29, 1922, Eden, (Abst.), 529

etiology of, Ottenberg, (Abst.), 526

evolution as a causative factor, Kirk, S. E., (Abst.), 525

further contributions on the question of, Engelmann, F., (Abst.), 532

placenta in, contribution to the study of changes in the, Soli, (Abst.), 526

puerperal, new experimental researches upon the pathogenesis and the therapeutics of, Levi-Solal, and Tzanek, (Abst.), 523

relationship of, to the other toxemias of pregnancy, Fitzgibbon, (Abst.), 528

significance of icterus in, Oppenheimer, W., (Abst.), 527

Stroganoff's improved method of the prophylactic treatment of, Stroganoff, (Abst.), 530

studies in the etiology of, Lawrence, (Abst.), 525

the, question, Wuth, (Abst.), 525

treated by the method of Stroganoff, one hundred cases of, Casta, N. P., (Abst.), 531

treatment of, by the Dublin method, Solomons, B., (Abst.), 532

Eclampsia, treatment—Cont'd

by veratrum viride, Stevens, (Abst.), 532

visual disturbances in, Hirsch, R., (Abst.), 527

Zweifel, E., (Abst.), 531

Eden, Eclampsia: a commentary on the report presented to the British Congress of Obstetrics and Gynecology, June 29, 1922, (Abst.), 529

Eerland, Extranterine pregnancy, (Abst.), 242

Ehrenfest, Hugo, Carbohydrate metabolism during pregnancy and the value of insulin to the obstetrician, 685

Eick, Bleeding from corpus luteum simulating an attack of appendicitis, (Abst.), 254

Embolism, air and gas, during labor, the question of, Koerting, (Abst.), 820

Engel, Varicose veins of the female pelvis, (Abst.), 681

Endometrium, hyperplasia of the, a clinical and pathological study, Novak, E., and Murtzloff, K. H., 385, 506

Engelmann, F., Further contributions on the question of eclampsia, (Abst.), 532

The necessity and results of early operation in tubal pregnancy, (Abst.), 242

Etiology of suppuration of the symphysis, Benthin, (Abst.), 819

Enfinger, H., Death from hemorrhage due to excessive menses in a patient with marked diabetes mellitus, (Abst.), 677

F

Falls, F. H., and Hunter, T. A., An improved head stethoscope for the hearing and counting of fetal heart tones, 356

Fetal heart tones, an improved head stethoscope for the hearing and counting of, Falls, F. H., and Hunter, T. A., 356

Fetus, full term extranterior, a study of the death of the, Oliver, J., (Abst.), 246

Fibroid growth of the uterus, septic thrombophlebitis of the left ovarian vein complicating, Vineberg, H. N., 225

tumors, present attitude towards, Neill, W., 205

uterine, dangerous intraperitoneal hemorrhage from, Ransahoff and Dreyfoos, 252

Fibroids, uterine, effects of radium therapy in cases of large, Brannan, C. F., 411, 502

- Fibromyomata, independent, of the broad ligament, Seaver, H. C., 639
- Findley, P., Spontaneous version, 646
- Fink, K., Intratubal degeneration of tubal pregnancies, (Abst.), 245
- Fitzgibbon, The relationship of eclampsia to the other toxemias of pregnancy, (Abst.), 528
- Forsyth, Erosion of the rectum by an ectopic placenta, (Abst.), 250
- Fothergill, W. E., Varicocele in the female, (Abst.), 681
- Frank, R. T., Function of the ovary, 573
- New books, (Collective Review), 371
- Freed, F. C., Embryotomy and hysterectomy in chondrodystrophic dwarf, 514
- Frey, F., Eclampsia and hydatid mole, (Abst.), 526
- Fuchs, H., Ovarian pregnancy in the absence of the corresponding tube, (Abst.), 248
- Fueth, H., An unique injury of the vaginal portion of the cervix during delivery (spontaneous ring-shaped separation of a large flap), (Abst.), 819
- Furniss, H. D., Incontinence of urine due to relaxed vesical sphincter, 195

G

- Galactocoele, the, Grynfeldt and Tzelepoglou, (Abst.), 381
- Gas pains, postoperative, the cause and prevention of, O'Keefe, C. D., 748
- Gellhorn, G., Milk injections in gynecology and obstetrics, 535, 649
- Gautret, (with Boursier), Acute polyhydramnios. Abdominal puncture with continuation of pregnancy, (Abst.), 814
- Genital papillae of women, Lipschutz, (Abst.), 676
- Genitalia, changes of the female, in lymphatic leukemia, Brakeman, (Abst.), 678
- disturbances in vision after hemorrhages from the, Puppel, E., (Abst.), 677
- female, a few relationships of the blood to the, Morawitz, (Abst.), 677
- pelvic, Schistosomiasis of the, with subsequent tubal pregnancy and abortion, des Lignaris, (Abst.), 250
- Genitourinary organs and the bowel, the afferent nerve supply of the, Ogilvy, (Abst.), 680
- Gestation, ectopic, with living fetus, a case of full term, Hicks, H. T., (Abst.), 246
- Gestation—Cont'd
- sac, bilateral interstitial ruptured ectopic, Woolf, (Abst.), 248
- tubal, salpingotomy versus salpingectomy in the treatment of, Whitehouse, (Abst.), 243
- Gilfrich, Rupture of the umbilical cord vessels during labor, (Abst.), 817
- Goldberger, M. A., Retention of urine due to postpartum parametritis, 232
- Goldmark, C., and Jacobs, A. W., Purpura hemorrhagica (postpartum) treated with radium and Roentgen ray with report of a case, 208
- Gonorrheal infection of the lower genital tract in infants and young girls, vaginosecopy in the treatment of, Randall, L. M., 345
- Gordon, O. A., Report of a case of Krukenberg tumor, 120
- Grad, Hermann, End results after operations in 53 cases of uterine prolapse, 163, 223
- Gregory, M. S., Mental diseases associated with childbearing, 420, 516
- Greig, Puberal mammary hypertrophy, (Abst.), 379
- Grynfeldt, E., and Tzelepoglou, C., The galactocoele, (Abst.), 381
- Guffey, D. C., (with Haden, R. L.), A case of pernicious vomiting of pregnancy with low blood chloride and marked response to sodium chloride therapy, 486
- Guy, W. P., A case of pregnancy in double uterus terminated by hysterotomy, 509
- Gwathmey, J. T., (with McKenzie, R. A., and Hudson, F. J.), Painless childbirth by synergistic methods (second paper), 154
- Painless childbirth by synergistic methods, 238
- Gynecology and allied disorders, Walthard, M., (Abst.), 673
- and rhino-laryngo-otology, Hartog, (Abst.), 678
- newer, Hirst, B. C., 1
- rectal examination in, Dales, (Abst.), 681

H

- Haden, R. L., and Guffey, Don C., A case of pernicious vomiting of pregnancy with low blood chlorides and marked response to sodium chloride therapy, 486
- Haendly, P., The causes of backache in women, (Abst.), 674
- Haggstrom, P., Prolapse of the umbilical cord, (Abst.), 817
- Handley, W. S., Lines of advance in the surgery of breast cancer, (Abst.), 382

- Harper, C. S., Management of occipito-posterior positions, (Abst.), 812
- Harris, John W., The after effects of the late toxemias of pregnancy, (Abst.), 529
- Hartog, Gynecology and rhino-laryngology, (Abst.), 678
- Haupt, The cause of high median sagittal presentation with especial consideration of disproportion between maternal pelvis and fetal head, (Abst.), 813
- Hawks, Immediate versus delayed operation in cases of collapse following ruptured ectopic pregnancy, (Abst.), 244
- Healy, W. P., Incarcerated pregnant retroflexed uterus due to an ectopic kidney, 233
- Myosarcoma complicating adenocarcinoma of the corpus uteri, 235
- Heaney, N. S., Ethylene and oxygen anesthesia for gynecological and obstetrical work, 416, 509
- Hellendall, H., Important questions regarding tubal pregnancy, (Abst.), 242
- Hemorrhage, abdominal, following rupture of a small ovarian cyst, Melchior, 252
- death from, due to excessive menses in a patient with marked diabetes mellitus, Enfinger, H., (Abst.), 677
- from the genitalia, disturbances in vision from, Poppel, E., (Abst.), 677
- intraperitoneal, of pelvic origin, discoloration of the umbilicus, Chifoliau, (Abst.), 251
- the ovary as a source of, Hornung, R., (Abst.), 251
- of ovarian and tubal origin, observations on, Schumann, (Abst.), 251
- postpartum, control of, by clamping the parametrium by Henkel's method, Zimmermann, (Abst.), 811
- Hernia, diaphragmatic, report of two cases of, Clark, J. D., 216
- Herriek, W. W., The role of an internist in an obstetric hospital, 479
- Hicks, J. T., A case of full term ectopic gestation with living fetus, (Abst.), 246
- Hingston and Mudaliar, Gleanings from the records of the government maternity hospital, Madras, (Abst.), 533
- Hinselmann, Nettekoven and Silberbach, Capillary circulation in eclampsia, (Abst.), 528
- Hirsch, R., Visual disturbances in eclampsia, (Abst.), 527
- Hirst, B. C., The causation and treatment of rupture of the uterus, 757, 804
- The newer gynecology, 1
- Hochenbichler, A., The entrance of the head into the pelvis in primiparas and multiparas, (Abst.), 812
- Hoenhorst, Eclampsia and the weather, (Abst.), 526
- Hornung, R., The ovary as a source of intraperitoneal hemorrhage, (Abst.), 251
- Hospital, government maternity, gleanings from the records of the, Madras, Hingston and Mudaliar, (Abst.), 533
- Hudson, F. J., (with Gwathmey, J. T., and McKenzie, R. A.), Painless childbirth by synergistic methods, 154
- Huhner, M., The diagnosis of sterility in the male and female, 63
- Hunner, Guy L., End results in one hundred cases of ureteral stricture, 793
- Hunter, A case of early ovarian pregnancy, (Abst.), 249
- Hydatid mole and eclampsia, Frey, F., (Abst.), 526
- with spontaneous rupture of the uterus, Krellenstein, I. B., 633
- Hydramnios, acute, and homologous triplets, Randall, L. M., 766
- Hysterectomy, report of a case of abdominal pregnancy following, McMillan and Dunn, (Abst.), 249

I

- Immunity, natural, in the newborn, Muselman, L. R., 141
- Incontinence of urine in women, the cure of, Miller, C. J., 492
- Infants, premature and feeble, an enclosed bed for, Morgenthaler, H. J. W., 622, 656
- Insulin, the value of, to the obstetrician, Ehrenfest, Hugo, 685
- Internist in an obstetric hospital, the rôle of an, Herriek, W. W., 479
- Irving, F. C., A new method of insuring sterility following cesarean section, 335

J

- Jacoby, P., The effect of small doses of pituitrin, (Abst.), 811
- Jacquin, P., Primary abdominal pregnancy, (Abst.), 249
- Jones, (with Van Zwalenburg and Card), Double uterine, 634

K

- Kahu, Infected extrauterine pregnancy rupturing into bladder after thirteen years, (Abst.), 250

- Kark, S. E., Eclampsia, evolution as a causative factor, (Abst.), 525
- Keene, F. E., The contraindications to radium in the treatment of diseases of the female pelvis, 201, 219
- Kellogg, F. S., Recurrent toxemia of pregnancy, 313
- Kinney, P. B., Internal migration of the ovum in the guinea pig, 198
- Klein, W., and Magid, M. O., Gynecologic plastic surgery under sacral-transsacral anesthesia, 79
- Klots, A case of incarceration of the pregnant retroflexed uterus with rupture of bladder, (Abst.), 815
- Koerting, The question of air, and gas embolism during labor, (Abst.), 820
- Kosakai, Z., The action of combinations of uterine stimulants, (Abst.), 810
- Krellenstein, I. B., Hydatid mole with spontaneous rupture of the uterus, 633
- Krukenberg tumor, report of a case of, Gordon, O. A., 120
- Küstner, The bacteriology of the separating umbilical cord under various methods of treatment, (Abst.), 816
- L
- Labor, air and gas embolism during, Koerting, (Abst.), 820
an aid in the treatment of acute anemia in, Runge, (Abst.), 253
complete circulation detachment of the portio vaginalis during, Pettersson, A. S., (Abst.), 818
observed through an abdominal window, Ludwig and Lenz, (Abst.), 808
rectal examinations in, the status of, Reiss, R. A., 475
rupture of the umbilical cord vessels during, Gilfrich, (Abst.), 817
- Lafont, Delayed "high" pain in extrauterine pregnancy. A new sign of tubal rupture, (Abst.), 244
- LaVake, R. T., A possible factor controlling the weight of the newborn. Relationship of the area of the placenta to the birth weight of the child based on observations in one hundred cases, 99
- Lawrence, Studies in the etiology of eclampsia, (Abst.), 525
- Lenz, (with Ludwig), Labor observed through an abdominal window, (Abst.), 808
The action of drugs on the uterus as viewed through an abdominal window, (Abst.), 679
- L'Esperance, Elise S., Early carcinoma of the cervix, 461
- Leucorrhea, psychical etiology and treatment of, Binger, (Abst.), 676
- Leukemia, lymphatic, changes of the female genitalia in, Brakeman, (Abst.), 678
- Levi-Solal and Tzanek, A., New experimental researches upon the pathogenesis and the therapeutics of puerperal eclampsia, (Abst.), 523
- Lewis and Wells, The function of the colostrum, (Abst.), 379
- Ligamentum uteri teres, the development of the, and the inguinal region in the human, Lubosch, (Abst.), 681
- Lipselutz, On the "genital papillae" of women, (Abst.), 676
- Lohnberg, Clinical features of ectopic pregnancy, (Abst.), 241
- Louria, H. W., A case of unilateral amastia, 364
- Lubosch, The development of the ligamentum uteri teres and the inguinal region in the human, (Abst.), 681
- Ludwig and Lenz, Labor observed through an abdominal window, (Abst.), 808
The action of drugs on the uterus as viewed through an abdominal window, (Abst.), 679
- Luker, S. G., The dangers and treatment of prolonged pregnancy, (Abst.), 814
- Me
- McCord, J. R., The results obtained in a conservative teaching clinic among 2500 negro patients, 723, 779
- McGrath, Inflammatory disease of the cervix uteri, 367
- McKenzie, R. A., (with Gwathmey, J. T., and Hudson, F. J.), Painless childbirth by synergistic methods, 154
- McMillan and Dunn, Report of a case of abdominal pregnancy following hysterectomy, (Abst.), 249
- McNally, F. P., A study of 1352 placentae with regard to white infarcts, 156
- M
- Maclaire, A. S., (with Sharpe, W.), Further observations of intracranial hemorrhage in the newborn: significance of yellow spinal fluid and of jaundice in these cases, 172
- Magid, M. O., (with Klein, W.), Gynecologic plastic surgery under sacral-transsacral anesthesia, 79
- Malpresentation, unusual, case of, Rowland, J. A., (Abst.), 813

- Mammary hypertrophy, pueral, Greig, (Abst.), 379
- Martzoß, K. H., (with Novak, E.), Hyperplasia of the endometrium, a clinical and pathological study, 385, 506
- Mastitis, puerperal, Dorman and Mossman, (Abst.), 380
the complications of, Nürnberger, (Abst.), 381
- Mayer, A., The relationship of obstetrics and gynecology to the war, (Abst.), 672
- Melchior, Abdominal hemorrhage following rupture of small ovarian cyst, (Abst.), 252
- Memet, J., The use, action and dangers of pituitary medication in obstetrics, (Abst.), 810
- Mental diseases associated with child-bearing, Gregory, M. S., 420, 516
disorders, reproductive organs in relation to, Mott, F. W., (Abst.), 674
- Metabolism, carbohydrate, during pregnancy, and the value of insulin to the obstetrician, Ehrenfest, Hugo, 685
- Midwifery and gynecology, neurasthenic element in, Buzzard, E. F., and Donald, A., (Abst.), 675
past, present and future of, Watson, B. P., (Abst.), 683
- Milk injections in gynecology and obstetrics, Gellhorn, G., 535, 649
- Miller, C. J., The construction of an artificial vagina with report of a case, 333
The cure of incontinence of urine in women, 492
- Moll, A., So-called sexual anesthesia of women, (Abst.), 675
- Moore, Intraabdominal hemorrhage from ruptured corpus luteum, (Abst.), 251
- Morawitz, A few relationships of the blood to the female genitalia, (Abst.), 677
- Morgenthau, An enclosed bed for premature and feeble infants, 622, 656
- Mossman, (with Dorman), Puerperal mastitis, (Abst.), 380
- Mott, F. W., The reproductive organs in relation to mental disorders, (Abst.), 674
- Mudaliar, (with Ifington), Gleanings from the records of the government maternity hospital, Madras, (Abst.), 533
- Musselman, L. K., Natural immunity in the newborn, 45, 141
- Myosarcoma complicating adenocarcinoma of the corpus uteri, Healy, W. P., 235

N

- Neill, W., Our present attitude towards fibroid tumors, 205
- Nephralgia with high blood pressure, Casler, Dewitt B., 569, 652
- Nettekoven, (with Hinselmann and Silberbach), Capillary circulation in eclampsia, (Abst.), 528
- Neurasthenic element, in midwifery and gynecology, Donald and Buzzard, (Abst.), 675
- Newborn, intracranial hemorrhage in the, further observations of, Sharpe, W., and MacLair, A. S., 172
natural immunity in the, Musselman, L. K., 45, 141
weight of, possible factor controlling the, LaVake, R. T., 99
- Newman, S. J., Gold pessary imbedded in a full term placenta, 513
- New York Academy of Medicine, Section on Obstetrics and Gynecology, Transactions of, 232, 367, 513
- New York Obstetrical Society, Transactions of, 219, 225, 366
- Novak, Bluish discoloration of the umbilicus in the diagnosis of ruptured extrauterine pregnancy, (Abst.), 251
Diagnosis of tubal pregnancy, (Abst.), 245
- Novak, E., (with Martzoß, K. H.), Hyperplasia of the endometrium, a clinical and pathological study, 385, 506
- Nürnberger, The biology of the isthmus uteri, (Abst.), 509
The complication of puerperal mastitis, (Abst.), 381
- Nystroem, B., Compression of the aorta in the practice of obstetrics, (Abst.), 811

O

- Obstetrical Society of Philadelphia, Transactions of, 799
- Obstetrics and gynecology from the standpoint of the general practitioner, Peterson, (Abst.), 683
relationship of, to the war, Mayer, A., (Abst.), 672
compression of the aorta in the practice of, Nystroem, B., (Abst.), 811
pituitary medication in, the use, action and dangers of, Memet, J., (Abst.), 810
- Occiput posterior, Cowles, H. C., 616, 656
positions, management of, Harper, C. S., (Abst.), 812
- Ogilvy, The afferent nerve supply of the female genito-urinary organs and the bowel, (Abst.), 680

- O'Keefe, C. D., The cause and prevention of postoperative gas pains, 748
- Oliver, J., A study of the death of the full term extrauterine fetus in situ, (Abst.), 246
- Oppenheimer, W., The significance of icterus in eclampsia, (Abst.), 527
- Ottenberg, The etiology of eclampsia, (Abst.), 526
- Ovarian cyst, of unusual size removed under local anesthesia, Stone, E. L., 351
- small, abdominal hemorrhage following rupture of, Melchior, (Abst.), 252
- Ovaries, solid carcinoma of, report of a case of, in girl of nineteen, Dickinson, R. L., 118
- Ovary as a source of intraperitoneal hemorrhage, Hornung, R., (Abst.), 251
- function of the, Frank, Robert T., 573
- Orum, internal migration of, in the guinea pig, Kinney, P. B., 198
- P
- Paddock, R., Recent observations of certain pathological conditions of the amnion, 546
- Paralysis, obstetrical, of the peroneal nerve, Whitman, (Abst.), 820
- Parametritis, postpartum, retention of urine due to, Goldberger, M. A., 232
- Peck, H. A., A rare congenital anomaly, 761
- Pelvic varicosities, Polak, John O., and Phelan, G. W., (Collective Review), 664
- Pelvis, contracted, clinical consideration of the, Burgess, H. C., 739, 787
- entrance of the head into the, in primiparas and multiparas, Hochenbichler, A., (Abst.), 812
- female, contraindications to radium in the treatment of diseases of the, Keene, F. E., 201, 219
- female, varicose veins of the, Emge, (Abst.), 681
- Pemberton, F. A., Acquired atresia of the vagina and cervix, 605, 660
- Perkins, Supernumerary breast on buttock, (Abst.), 379
- Pessary, intrauterine contraceptive, Sisdall, R. S., 76
- Peterson, Obstetrics and gynecology from the standpoint of the general practitioner, (Abst.), 683
- Peterson, R., The diagnosis of early pregnancy in roentgenography, 770
- Pettersson, A. S., Complete circular detachment of the portio vaginalis during labor, (Abst.), 818
- Pfeiffer, The management of breech presentation, (Abst.), 813
- Phaneuf, L. E., Uterine prolapse, cystocele, rectocele, An analysis of sixty-three cases operated upon by the vaginal route, 322
- Phelan, G. W., (with Polak, John O.), Pelvic varicosities, (Collective Review), 664
- Piper, Edmund B., Two cases of ruptured uterus, 799
- Pitcher, H. F., Pruritus ani et vulvae, (Abst.), 682
- Pituitary medication in obstetrics, use, action and dangers of, Mennet, J., (Abst.), 810
- Pituitrin, effect of small doses of, Jacoby, P., (Abst.), 811
- Placenta, erosion of the rectum by an ectopic, Forsyth, (Abst.), 250
- gold pessary imbedded in a full term, Newman, S. L., 513
- study of 1352 with regard to white infarcts, McNally, F. P., 186
- Placental infarct, its relation to the etiology of deformed babies, Talbot, J. E., 271
- Polak, J. O., (with Wolfe, Samuel A.) A further study of the origin of uterine bleeding in tubal pregnancy, 730, 783
- (with Phelan, G. W.), Pelvic varicosities, (Collective Review), 664
- Polyhydramnios, acute, abdominal puncture with continuation of pregnancy, Boursier and Gautret, (Abst.), 814
- Postoperative gas pains, cause and prevention of, O'Keefe, C. D., 748
- Pregnancies, contribution to the study of simultaneous uterine and tubal, Stropeni, (Abst.), 247
- tubal, intratubal degeneration of, Fink, M., (Abst.), 245
- Pregnancy, abdominal, following hysterectomy, report of a case of, McMillan and Dunn, (Abst.), 249
- carbohydrate metabolism during, and the value of insulin to the obstetrician, Ehrenfest, Hugo, 685
- diagnosis of early, in roentgenography, Peterson, R., 770
- ectopic, clinical features of, Lohnberg, (Abst.), 241
- immediate versus delayed operation in case of collapse following ruptured, Hawks, (Abst.), 244
- re-infusion of blood in ruptured, Töpler, (Abst.), 252
- extrauterine, Eerland, (Abst.), 242
- bluish discoloration of the umbilicus in the diagnosis of ruptured, Novak, (Abst.), 251
- delayed "high" pain, a new sign of tubal rupture, Laffont, (Abst.), 244

Pregnancy, extrauterine—Cont'd
 infected, rupturing into h. a. Jer
 after thirteen years, Kalin,
 (Abst.), 250
 glycosuria with hyperglycemia,
 Schenck, S. B., 457
 in double uterus terminated by hys-
 terotomy, a case of, Guy, W. P.,
 509
 interstitial, Daniel, (Abst.), 248
 ovarian, case of early, Hunter,
 (Abst.), 249
 in the absence of the corresponding
 tube, Fuchs, H., (Abst.), 248
 report of a case, Chalfant, (Abst.),
 249
 pernicious vomiting of, a case of, with
 low blood chlorides and marked
 response to sodium chloride ther-
 apy, Haden, R. L., and Guffey,
 Don Carlos, 486
 prolonged, dangers and treatment of,
 Luker, S. G., (Abst.), 814
 primary abdominal, Jacquin, P.,
 (Abst.), 249
 recurrent toxemia of, Kellogg, F. S.,
 313
 ruptured ectopic, re-infusion of blood
 in, Töpfer, (Abst.), 252
 toxemia, eclampsia and, as a specific
 disease of human reproduction
 and culture, Sellheim, H., (Abst.),
 524
 toxemias of, the after effects of the
 late, Harris, J. W., (Abst.), 529
 the phenoltetrachlorophthalein test of
 liver function, Smith, J. A., 298
 tubal and intranterior, simultaneous,
 Sippel, (Abst.), 247
 conservatism in surgical treatment
 of, Dossens, G., (Abst.), 243
 decidual reaction in the tubes in
 single or bilateral, during the
 first three months, Trauen-Rainer,
 (Abst.), 245
 diagnosis of, Novak, (Abst.), 245
 further study of the origin of
 uterine bleeding in, Polak, John
 O., and Wolfe, Samuel A., 730.
 783
 important questions regarding, Hel-
 lendall, H., (Abst.), 242
 menstrual disturbance and pain in,
 Broun, (Abst.), 244
 necessity and results of early opera-
 tion in, Engelmann, F., (Abst.),
 242
 repeated, in the same patient, Ben-
 zel, (Abst.), 247
 unilateral twin tubal, Thorek,
 (Abst.), 248
 unsuspected, Rombach, (Abst.), 814
 Presentation, breech, management of,
 Pfeiffer, (Abst.), 813

Presentation—Cont'd
 Cause of high median sagittal, with
 especial consideration of dispro-
 portion between maternal pelvis
 and fetal head, Haupt, (Abst.),
 813
 Presentations, brow, treatment of, Stigl-
 baner, R., (Abst.), 813
 high median occiput, Weinzierl,
 (Abst.), 812
 Pruritus ani et vulvae, Pitcher, H. F.,
 (Abst.), 682
 Puerperal infection, six cases of, Ron-
 sheim, J., 359
 mastitis, Dorman and Mossman,
 (Abst.), 380
 complications of, Nürnberger,
 (Abst.), 381
 sepsis, serum treatment of, Bailey,
 Harold, 7
 Puppel, E., Disturbances in vision after
 hemorrhages from the genitalia,
 (Abst.), 677
 Purpura hemorrhagica (postpartum)
 treated with radium and roentgen
 ray with report of a case, Gold-
 mark, C., and Jacobs, A. W., 208

R

Radium and roentgen ray, purpura
 hemorrhagica (postpartum)
 treated with, Goldmark, C., and
 Jacobs, A. W., 208
 in the treatment of diseases of the
 female pelvis, contraindications
 to, Keene, F. E., 201, 219
 therapy, effects of, in cases of large
 uterine fibroids, Burnam, O. F.,
 411, 502
 Randall, L. M., Acute hydramnios and
 homologous triplets, 766
 Vaginoscopy in the treatment of
 gonorrheal infection of the lower
 genital tract in infants and young
 girls, 345
 Ranshoff and Dreyfoos, Dangerous in-
 traperitoneal hemorrhage from
 uterine fibroid, (Abst.), 252
 Rectal examination in gynecology, Dales,
 (Abst.), 681
 Reis, R. A., The status of rectal ex-
 aminations in labor, 475
 Reproductive organs in relation to men-
 tal disorders, Mott, (Abst.), 674
 Renal papillomata and ureteral implants
 in the female, surgical treatment
 of, Bissell, Dongal, 796
 Results obtained in a conservative teach-
 ing clinic among 2500 negro pati-
 ents, McCord, J. R., 723, 779
 Retransfusion of blood, poured into ab-
 dominal cavity, indications for,
 Zimmermann, (Abst.), 253
 Robinson, M. R., and Zondek, B., Ex-
 perimental attempts to promote
 uterine growth, 83

- Röntgenography, diagnosis of early pregnancy in, Peterson, R., 770
- Rombach, Unsuspected pregnancy, (Abst.), 814
- Ronsheim, J., Six cases of puerperal infection, 359
- Rosenberg, Menstrual changes in the breast, (Abst.), 379
- Rowland, J. A., A case of unusual malpresentation, (Abst.), 813
- Runge, An aid in the treatment of acute anemia in labor, (Abst.), 253

S

- Sage, E. C., An unusual example of ectrophy of the bladder with marked separation of the pubic bones, 497
- Sanders, Death in married and unmarried women in the middle period of life, (Abst.), 673
- Schenck, S. B., Pregnancy glycosuria with hyperglycemia, 457
- Schistosomiasis, a case of, of the female pelvic genitalia with subsequent tubal pregnancy and abortion, des Lignaris, (Abst.), 250
- Schumann, Observations on hemorrhage of ovarian and tubal origin, (Abst.), 251
- The relation of venereal diseases to childbirth, 257, 366
- Seaver, H. C., Independent fibromyomata of the broad ligament, 639
- Selected Abstracts:
- Breast, 378
 - Eclampsia, 523
 - Extruterine pregnancy and intra-abdominal hemorrhages, 241
 - General gynecology, 671
 - Physiology and pathology of labor, 808
- Sellheim, H., Eclampsia and pregnancy toxemia as a specific disease of human reproduction and culture, (Abst.), 524
- Sepsis, puerperal, serum treatment of, Bailey, H., 7
- Sex glands of the domestic pig, morphologic study of some phases in the development of the, Wilson, Karl M., 710
- Sharpe, W., (with MacLair, A. S.), Further observations of intracranial hemorrhage in the newborn; significance of yellow spinal fluid and of jaundice in these cases, 172
- Shoulder delivery, direct, of Müller, Abernethy, (Abst.), 814
- Sidall, R. S., Chorioangiofibroma, 430, 554
- The intrauterine contraceptive pessary, inefficient and dangerous, 76

- Silberbach, (with Hirschmann), Capillary circulation in eclampsia, (Abst.), 528
- Sippel, Simultaneous tubal and intrauterine pregnancy, (Abst.), 247
- Sistrunk, Cancer of the breast with a study of the results obtained in two hundred and eighteen cases, (Abst.), 382
- Smith, J. A., The phenoltetrachlorophthalein test of liver function in the toxemias of pregnancy, 298
- Soli, Contribution to the study of changes in the placenta in eclampsia, (Abst.), 526
- Solomons, B., The treatment of eclampsia by the Dublin method, (Abst.), 532
- Stevens, The treatment of eclampsia by veratrum viride, (Abst.), 532
- Sterility, diagnosis of, in the male and female, Hühner, Max, 63
- following cesarean section, new method of insuring, Irving, F. C., 335
- progress in the relief of, Curtis, A. H., (Collective Review), 123
- Stiglbauer, R., The treatment of brow presentations, (Abst.), 813
- Stone, E. L., An ovarian cyst of unusual size removed under local anesthesia, 351
- Contractions of the pelvic outlet necessitating delivery by cesarean section, 625
- Straganoff, My improved method of the prophylactic treatment of eclampsia, (Abst.), 530
- Stropeni, Contribution to the study of simultaneous uterine and tubal pregnancies, (Abst.), 247
- Symphysis, suppuration of the, etiology of, Bentlin, (Abst.), 819

T

- Talbot, J. E., The placental infarct and its relation to the etiology of deformed babies, 271
- Taylor, H. C., and Peightal, T. C., End results of 201 cases of carcinoma of the cervix, 288
- Temesvary, The treatment of puerperal conditions of the breast with light, (Abst.), 381
- Torek, Unilateral twin tubal pregnancy, (Abst.), 248
- Triplets, homologous, and acute hydramnios, Randall, L. M., 766
- Tzauek, A., (with Levi-Solal), New experimental researches upon the pathogenesis and the therapeutics of puerperal eclampsia, (Abst.), 523
- Tzelepoglou, C., (with Gynfellet, E.), The galactoele, (Abst.), 381

U

- Umbilicus, discoloration of the, in intra-peritoneal hemorrhage of pelvic origin, Chisolm, (Abst.), 251
- Ureteral stricture, end results in one hundred cases of, Hunner, Guy L., 793
- Urine, incontinence of, due to relaxed vesical sphincter, Furniss, H. D., 195
in women, cure of, Miller, C. J., 492
retention of, due to postpartum parametritis, Gildberger, M. A., 232
- Urogenital symptoms in gynecologic patients, the incidence and significance of, Dammreuther, W. T., 103
- Uteri, biology of the isthmus, Nürnberg, (Abst.), 809
myosarcoma complicating adenocarcinoma of the corpus, Healy, W. P., 235
- Uterine fibroid, dangerous intraperitoneal hemorrhage from, Ransohoff and Dreyfoos, (Abst.), 252
growth, experimental attempts to promote, Robinson, M. R., and Zondek, B., 83
prolapse, cystocele, rectocele, An analysis of sixty-three cases operated upon by the vaginal route, Phaneuf, L. E., 322
end results after operations in 53 cases of, Grad, H., 163, 223
stimulants, action of combinations of, Kosakai, Z., (Abst.), 810
- Uterus, action of drugs on the, as viewed through an abdominal window, Lenz, (with Ludwig), (Abst.), 679
double, Van Zwalenburg, C., (with Card, T. A., and Jones, W. A.), 634
incarcerated pregnant, retroflexed, due to an ectopic kidney, Healy, W. P., 233
incarceration of pregnant retroflexed, a case of, with rupture of bladder, Klotz, (Abst.), 816
mixed cell tumor of the, Wiener, S., 211, 219
pregnant, characteristics of the present day conception and management of retroflexion of the, 815
rupture of, causation and treatment of, Hirst, B. C., 757, 804
ruptured, two cases of, Piper, Edmund B., 799
spontaneous rupture of the, hydatid mole with, Krollenstein, I. B., 633

V

- Vagina and cervix, acquired atresia of the, Pemberton, F. A., 605, 660
artificial, construction of, with report of a case, Miller, C. J., 333

- Vaginosecopy in the treatment of gonorrheal infection of the lower genital tract in infants and young girls, Randall, L. M., 345
- Van Zwalenburg, C., (with Card and Jones), Double uterine, 634
- Varices, perifibromatous, the peritoneal inundation of rupture of, Weber, E., (Abst.), 252
- Varicocele in the female, Fothergill, W. E., (Abst.), 681
- Varicose veins of the female pelvis, Emge, (Abst.), 681
- Veneral diseases, the relation of, to childbirth, Schumann, E. A., 257, 366
- Version, spontaneous, Findley, P., 646
- Vesico-vaginal fistula, Watkins, Thomas J., 790
- Vineberg, H. N., Septic thrombophlebitis of the left ovarian vein complicating a fibroid growth of the uterus (case report), 225
Septic thrombophlebitis of right ovarian vein following curettage of non-pregnant uterus (case report), 225
- Vogt, E., Characteristics of the present day conception and management of retroflexion of the pregnant uterus, (Abst.), 815
- Vulva, filarian elephantiasis of, De-Aragon, (Abst.), 682

W

- Walshard, M., Gynecology and allied disorders, (Abst.), 673
- Wassermann test, Belding, D. L., and Hunter, I. L., 22
- Watson, B. P., The past, present and future of midwifery, (Abst.), 683
- Watkins, Thomas J., Vesico-vaginal fistula, 790
- Weber, E., The peritoneal inundation of rupture of perifibromatous varices, (Abst.), 252
- Weinzierl, High median occiput presentations, (Abst.), 812
- Wells, (with Lewis), The function of the colostrum, (Abst.), 379
- Whitehouse, Salpingotomy versus salpingectomy in the treatment of tubal gestation, (Abst.), 243
- Whitman, Obstetrical paralysis of the peroneal nerve, (Abst.), 820
- Wiener, S., A mixed cell tumor of the uterus, 211, 219
- Wilson, K. M., A morphologic study of some phases in the development of the sex glands of the domestic pig, 710

Winter, War and after war casualties among women, (Abst.), 671

Wolfe, Samuel A., (with Polak, John O.), Further study of the origin of uterine bleeding in tubal pregnancy, 730, 783

Women's diseases, the relationship of, to the chronic patient, Culbertson, (Abst.), 674

Woolf, Bilateral interstitial ruptured ectopic gestation sac, (Abst.), 248

Wnfl, The eclampsia question, (Abst.), 525

Z

Zangemeister, Manual replacement of prolapsed cord, (Abst.), 818

Zimmermann, Indications for retransfusion of blood poured into the abdominal cavity, (Abst.), 253

The control of postpartum hemorrhage by clamping the parametrium by Henkel's method, (Abst.), 811

Zondek, B., (with Robertson, M. R.), Experimental attempts to promote uterine growth, 83

Zweifel, E., On eclampsia, (Abst.), 531

